

April 25, 2008

TO: Members of the MAG Specifications and Details Committee

FROM: Robert Herz, Maricopa County DOT, Chairman

SUBJECT: MEETING NOTIFICATION AND TRANSMITTAL OF AGENDA

Wednesday, May 7, 2008 at 1:30 p.m.  
MAG Office, Second Floor, Cholla Room  
302 North First Avenue, Phoenix

The meeting of the MAG Specifications and Details Committee will be held at the place and time indicated above. The agenda for the meeting is provided below. **Please park in the garage under the building. Bring your ticket to the meeting, parking will be validated. For those using transit, the Regional Public Transportation Authority will provide transit tickets for your trip. For those using bicycles, please lock your bicycle in the bike rack in the garage.** Please call me at (602) 506-4760 if you have questions about the upcoming meeting.

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The discussion time for individual cases will be limited to approximately 5 minutes per case. This limitation is due to the large number of active cases and is intended to provide an opportunity for all cases to be addressed. It is requested (not required) that written comments be prepared in advance for distribution at the meeting.

#### AGENDA

<u>ITEM</u>	<u>COMMITTEE ACTION REQUESTED</u>
1. <u>Call to Order</u>	1. No action required.
2. <u>Approval of April 2, 2008 Meeting Minutes</u>	2. Corrections and approval of April 2, 2008 minutes.
3. <u>2007 &amp; 2008 Cases</u>	3. Review of pending cases and submission of new cases for consideration.
4. <u>General Discussion</u>	4. For information and discussion.
5. <u>Adjournment</u>	5. No action required.

MEETING MINUTES FROM THE  
MARICOPA ASSOCIATION OF GOVERNMENTS  
STANDARD SPECIFICATIONS AND DETAILS COMMITTEE

April 2, 2008

Maricopa Association of Governments Office, Cholla Room  
302 North First Avenue  
Phoenix, Arizona

AGENCY MEMBERS

Jim Badowich, Avondale	Gordon Haws, Mesa
Steven Borst, Buckeye	* Jesse Gonzalez, Peoria
Warren White, Chandler	Jeff Van Skike, Phoenix (St. Trans.)
Dennis Teller, El Mirage	Jami Erickson, Phoenix (Water)
* Kelli Kurtz, Gilbert	Mark Palichuk, Queen Creek
Tom Kaczmarowski, Glendale	Rodney Ramos, Scottsdale
Troy Tobiasson, Goodyear	Loren Kelley, Surprise
Bob Herz, MCDOT	James Bond, Tempe

ADVISORY MEMBERS

John Ashley, ACA	* Adrian Green, ARPA
Jeff Benedict, AGC	Paul R. Nebeker, Independent
Brian Gallimore, AGC	William Ast, NUCA
Peter Kandaris, SRP, Vice Chairman	Dale Phelan, NUCA
James Carusone, ARPA	

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Gordon Tyus

\* Members not attending or represented by proxy.

GUESTS/VISITORS

Marivel Cano, Tensar International  
Derek Von Cannon, ADS-Nyloplast  
Jeff Nielson, Contech Construction Products, Inc.  
John Rapacz, TekWay Dome-Tiles

1. Call to Order

Chairman, Bob Herz, called the meeting to order at 1:34 p.m.

## 2. Approval of Minutes

The members reviewed the March 5, 2008 meeting minutes. Rodney Ramos introduced a motion to accept the minutes as written. John Ashley seconded the motion. A voice vote of all ayes and no nays was recorded.

## 3. 2007 Cases (old cases)

a. **Case 07-02 – Revisions to Asphalt Concrete, Sections 321 and 710:** Major re-writes of Asphalt Concrete placement and materials Sections 321 and 710 as proposed by the Asphalt Paving Technical Committee (APTC). Jeff Benedict gave a progress report on recent committee meetings for resolving comments, noting that a consensus had been reached on the penalty portion of Section 321. The technical committee expects to finish resolving Section 321 comments at the next meeting and begin work on Section 710 comments. APTC will meet at the ARPA offices (916 W. Adams Street, Phoenix) on April 10<sup>th</sup> at 11:30am to continue the work.

b. **Case 07-03A – PVC Catch Basins, Proposed New Details 535-2, 535-3, 537-2 & 539-2. Case 07-03B – Inlet Structures, Proposed New Details 542-1 through 4 & 543-1 through 5:** Details to allow the use of PVC catch basins and inlet structures. Revised details were distributed to members along with photographs clarifying PVC basin neck fit on metal basin castings. Committee members recommended that tolerances on grates and frames be clearly identified to insure that maximum gaps are less than ½” and that the pivot adjustment shown on Detail 543-3 be sufficiently detailed for fabrication. Dale Phelan will address comments and provide revisions for the next meeting.

c. **Case 07-08 – Revision to Section 615.2, Sewer Line Construction:** Provide water ponding tolerances inside sewer pipe. Jami Erickson has located City of Phoenix specifications for video inspection of liners and will provide a copy to Mark Palichuk. Mark will prepare revisions for the next meeting.

d. **Case 07-11 – Revision to Detail 370, Vertical Realignment of Water Mains:** Include an option for realignment of ductile iron mechanical joint. The committee had no discussion on this item. Jesse Gonzalez will have revisions for the next meeting.

e. **Case 07-12 – Revision to Detail 404-2, Water & Sanitary Sewer Separation/Protection:** Adding language to clarify the location of pipe and joint restraints to insure that fittings/couplings do not fail and create cross-contamination. The committee had no discussion on this item. Jesse Gonzalez will have revisions for the next meeting.

## 4. 2008 Cases (new cases)

a. **Case 08-01 – Revisions to Borrow Excavation, Section 210:** Defining acceptance criteria for import borrow material. Jim Carusone noted that ADOT has similar requirements for import fill soils. Bob Herz said he will contact the person who

developed the criteria for the county to get an explanation of its origin. Brian Gallimore expressed concern over the possible misuse of more strict import fill requirements. The cost of import to meet the new section requirements could be substantial, so he emphasized that there should be a clear understanding of where this fill is to be used (within the road prism). Brian also requested that the section clearly state contractor and agency responsibility for meeting the new acceptance criteria with import from agency-specified sources. Bob will prepare revisions for the next meeting to address the discussion items. Committee members were requested to continue reviewing the proposal and return with comments for the next meeting.

b. **Case 08-02 – New Section 317, Asphalt Milling:** Construction requirements for milling existing asphalt concrete. No new comments were provided at this time. Bob will prepare revisions for the next meeting based on prior comments.

c. **Case 08-03 – New Section 325, Asphalt – Rubber Concrete Overlay, Gap Graded:** Material and construction requirements for gap-graded asphalt-rubber concrete used as an asphalt pavement. Jeff Benedict and Jim Carusone provided written comments on the proposed new section, including a comparative table of asphalt-rubber pavement mix design requirements from ADOT, MCDOT, and the Cities of Glendale, Mesa and Phoenix. Jeff and Jim noted that there is a subcommittee working on binder and aggregate gradation aspects of the mix design and they expect to have specific recommendations for changes in a few weeks. Members were requested to continue reviewing the new section and provide any additional comments at the next meeting.

d. **Case 08-04 – New Details 180-1 & 180-2, Portable Water Tank Fill Pipe and Backflow Prevent Details:** Approved methods for filling portable water tanks and trucks. Warren White stated that he is continuing to discuss with water quality groups the need for the new details. Steve Borst provided an excerpt from the Arizona Administrative Code and a page from the USC Cross-Connection Control Manual. He noted that any new details must not be in conflict with these documents. The committee continued discussing whether the MAG standards should address this issue. Steve will work with Warren White to determine the best way to address these issues and will get back to the committee with possible case revisions.

e. **Case 08-05 – Revisions to Safety Post Detail 140:** A revision to incorporate multiple agency safety post designs and include hazard marker requirements with the existing safety post detail. Warren White provided changes to the detail that included revisions as suggested during the previous meeting. It was noted that removable bollards still need to be included in the detail and that separate details may be needed for safety posts/bollards and hazard markers. Members were requested to continue reviewing the new detail revisions and provide comments at the next meeting.

f. **Case 08-06 – Modification to Storm Drain Construction, Section 618.3:** Additions to include leakage test procedures for HDPE storm drain pipes and require video inspection before final paving is allowed. After discussion, the committee agreed that the testing requirements be modified to include all pipe types and not be limited to just

HDPE. Brian Gallimore asked for a clarification about the location of pipe joints to be tested. After a discussion, members agreed that the three specified joints to be tested will be at locations selected by the agency engineer and remove any reference to specific locations from the section. Jeff Van Skike will prepare revisions based on the discussions.

g. **Case 08-07 – Modification to Measurements and Payment, Section 109:** Revisions to better define compensation with change orders. Gordon Haws provided revisions that flagged the proposed changes. Committee members were requested to review the proposed changes and return with comments for the next meeting.

h. **Case 08-08 – Modification to Subgrade and Trench Compaction, Sections 301.3 and 601.4:** Revisions to modify subgrade compaction requirements and include tolerances for optimum moisture. Gordon Haws provided revisions that flagged the proposed changes. Members were concerned that the optimum moisture range may not be adequate for difficult soils and suggested that the range may be applicable as a default value. It was also recommended that the term “Other traffic ways” in Section 301.3(B) be better defined. Committee members were requested to review the proposed changes and return with comments for the next meeting.

i. **Case 08-09 – Modification to Sewer Manhole Construction, Subsection 625.3.1:** Additions to sewer manhole frame and cover construction. Upon review of the present MAG requirements, Gordon Haws determined that the changes proposed were already adequately addressed in the MAG section. The case was withdrawn.

j. **Case 08-10 – Modification to Trench Backfill and Pavement Replacement, Detail 200, Section 336 and Section 601:** Revisions to eliminate numerous agency trench backfill and pavement replacement supplemental details by combining the most common practices. The members discussed the use of ½-sack cement versus 1-sack cement controlled low strength material backfill and reviewed the changes proposed for “T-top” pavement repairs. Committee members were requested to continue reviewing the proposal and return with comments for the next meeting.

k. **Case 08-11 – Revisions to Driveway Entrance Detail 250:** Changes to make sidewalk installations in driveway entrances ADA compliant (revisions as requested by the supplements subcommittee). Jeff Van Skike stated that the City of Phoenix recently drafted similar changes for driveway ADA compliance and recommended that the committee review these prior to any final revisions to MAG specifications. The committee discussed sidewalk minimum and maximum distances back of curb in proposed Detail 250-1. Members recommended increasing commercial and industrial drives thickness from 6 inches to 9 inches, looking at other driveway details and styles that may be more applicable to the proposed modifications, and widening the wing portion of the sidewalk transition by another 5 feet with vertical curbs. Bob Herz will prepare revisions for the next meeting to address the discussion items. Committee members were requested to continue reviewing the proposal and return with comments for the next meeting.

l. **Case 08-12 – New Section 331, Microsealing, and Section 714, Microsurfacing Materials:** New sections (currently part of the City of Phoenix supplements) for pavement microsurfacing materials. Jeff Van Skike provided revisions to the new sections, including placement requirements within a new Section 331. Committee members were requested to continue reviewing the new sections and return with comments for the next meeting.

m. **Case 08-13 – Modification to Manhole, Valve Box and Water Meter Box Adjustments, Section 345:** Revisions to require contractors be responsible for locating and referencing the location of utilities during surface improvement projects so that needed adjustments are performed (revisions as requested by the supplements subcommittee). Jeff Van Skike summarized the proposed changes and requested committee members review the proposal and return with comments for the next meeting.

n. **Case 08-14 – Revisions to Utility Pothole Repair Detail 212:** Jeff Van Skike presented a revision to MAG Detail 212 to allow multiple backfill and asphalt concrete materials for repair of utility potholes. At present, only ½-sack cement CLSM backfill and 12.5 mm asphalt concrete are allowed for repairs, with asphalt concrete placed within 4 hours of CLSM backfill. The proposed change allows agencies more flexibility to insure that more backfill and asphalt concrete products are available and eliminates the time restriction. Committee members were requested to review the proposal and return with comments for the next meeting.

5. General Discussion:

John Ashley said that the supplements subcommittee will meet on Wednesday, April 23<sup>rd</sup> at 1:30 pm at MAG's offices to review the progress of their work. He also noted that the concrete modernization subcommittee will next meet at 1:30 pm on Wednesday, May 14<sup>th</sup> at the ARPA offices (916 W. Adams Street, Phoenix).

John Rapacz with TekWay Dome-Tiles introduced himself to the committee.

Jeff Nielson with Contech Construction Products requested that a committee member sponsor a new specification on PVC storm drain materials.

6. Adjournment:

The meeting was adjourned at 3:40 p.m.

## 2008 PROPOSED REVISIONS TO MAG SPECIFICATIONS AND DETAILS

CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE
07-02	Revision/ Re-Write Section 710 & Section 321	AGC ARPA	Jeff Benedict (Don Green)	2/07/2007 2/06/2008		0 Yes 0 No 0 Abstain
07-03 A	PVC Catch Basins - New Details 535-2, 535-3, 537-2, 539-2	NUCA	Dale Phelan	2/07/2007 4/02/2008		0 Yes 0 No 0 Abstain
07-03 B	PVC Inlet Structures - New Details 542-1, 542-2, 543-1, 543-2, 543-3.	NUCA	Dale Phelan	2/07/2007 4/02/2008		0 Yes 0 No 0 Abstain
07-08	Revision to Section 615 Sewer Line Construction – Clarify tolerances for pipe versus trench bottom.	Queen Creek	Mark Palichuk (Gerald Wright)	5/02/2007 8/01/2007		0 Yes 0 No 0 Abstain
07-11	Revision to Detail 370, Vertical Realignment of Water Mains	Peoria	Jesse Gonzalez	6/06/2007		0 Yes 0 No 0 Abstain
07-12	Revision to Detail 404-2, Water & Sanitary Sewer Separation/Protection	Peoria	Jesse Gonzalez	6/06/2007		0 Yes 0 No 0 Abstain
08-01	Revision to Section 210 Borrow Excavation	MCDOT	Bob Herz	1/02/2008 3/05/2008		0 Yes 0 No 0 Abstain
08-02	New Section 317, Asphalt Milling	MCDOT	Bob Herz	1/02/2008		0 Yes 0 No 0 Abstain
08-03	New Section 325, Asphalt – Rubber Concrete Overlay, Gap Graded	MCDOT	Bob Herz	1/02/2008		0 Yes 0 No 0 Abstain
08-04	New Details 180-1 and 180-2, Portable Water Tank Fill Pipe and Backflow Prevent Details	Chandler	Warren White (David Fern)	1/02/2008		0 Yes 0 No 0 Abstain
08-05	Revisions to Safety Post Detail 140	Chandler	Warren White (David Fern)	1/02/2008 4/02/2008		0 Yes 0 No 0 Abstain

# 2008 PROPOSED REVISIONS TO MAG SPECIFICATIONS AND DETAILS

CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE
08-06	Revision to Section 618.3 Construction Methods, add Leakage Test Procedures for HDPE Storm Drain Pipe.	Phoenix	Jeff Van Skike	2/06/2008 2/06/2008		0 Yes 0 No 0 Abstain
08-07	Revisions to Section 109.4 Compensation for Alteration of Work	Mesa	Gordon Haws	2/06/2008 4/02/2008		0 Yes 0 No 0 Abstain
08-08	Revisions to Section 301.3 Relative Compaction and Section 601.4 Foundation, Bedding, Backfilling and Compaction concerning optimum moisture and percent compaction.	Mesa	Gordon Haws	2/06/2008 4/02/2008		0 Yes 0 No 0 Abstain
08-09	Revisions to Section 625.3.1 Manholes	Mesa	Gordon Haws	2/06/2008 4/02/2008	Case Withdrawn 4/02/2008	0 Yes 0 No 0 Abstain
08-10	Detail 200 and Sections 336 and 601 – Trench backfill and pavement Replacement	SRP	Peter Kandaris	2/06/2008 4/02/2008		0 Yes 0 No 0 Abstain
08-11	Revisions to Detail 250 DRIVEWAY ENTRANCES	MCDOT	Bob Herz	3/05/2008		0 Yes 0 No 0 Abstain
08-12	New Section 331, Microseal Specifications New Section 714, Microsurfacing Materials	Phoenix	Jeff Van Skike	3/05/2008 4/02/2008		0 Yes 0 No 0 Abstain
08-13	Revision to Section 345 Adjusting Frames, Covers, Valve Boxes and Water Meter Boxes	Phoenix	Jeff Van Skike	3/05/2008		0 Yes 0 No 0 Abstain
08-14	Revision to Detail 212 UTILITY POTHOLE REPAIR	Phoenix	Jeff Van Skike	4/02/2008		0 Yes 0 No 0 Abstain
						0 Yes 0 No 0 Abstain

\* Case was approved with verbal modifications at time of voting.



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**SECTION 321**

Revised 4-10-08

**ASPHALT CONCRETE PAVEMENT****321.1 DESCRIPTION:**

This section is to provide specifications for furnishing all materials, mixing at a plant, hauling and placing a mixture of aggregate materials, mineral admixture and asphalt binder to form a pavement course for the following situations or projects

- A capital improvement project where the work is being performed under a contract directly between the contractor and the Owner.
- A project being constructed under a permit, where the Owner's control and responsibility for maintenance will eventually be transferred upon dedication of the project or roadway to a city, county, or other entity.
- A project where the Owner is a private individual, company, or group and no city, county or other agency specifications apply to the project.

**321.2 MATERIALS AND MANUFACTURE:**

The materials shall conform to Section 710 for the type specified. The specific required mix type shall be called out in the contract documents or as directed by the Engineer.

**321.3 WEATHER AND MOISTURE CONDITIONS:**

Asphalt concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 40 degrees F. or above. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base on which the material is to be placed contains excessive moisture and is unstable. Excessive moisture is defined as the base or subgrade moisture is in excess of 2 percent above optimum moisture, determined in accordance with AASHTO T 99 corrected for the appropriate rock percentage. Asphalt concrete shall be placed only when the Engineer determines that weather conditions are suitable.

**321.4 APPLICATION OF TACK COAT:**

A tack coat shall be applied to all existing and to each new course of asphalt concrete prior to the placing of a succeeding lift of asphalt concrete. The tack coat may be deleted when a succeeding layer of asphalt concrete is being applied over a freshly laid course that has been subjected to very little traffic when approved by the Engineer.

The application of the tack coat shall comply with Section 329. The grade of emulsified asphalt shall be SS-1 h or CSS-1h as specified in Section 713.

The same material that is specified above for the tack coat shall be applied to the vertical surfaces of existing pavements, curbs, and gutters, against which asphalt concrete is to be placed.

The surface to be covered may require repair or patching as directed by the Engineer. This shall be addressed in the project specifications prior to the bidding of the project.

**321.5 MIX DESIGN**

The mix design shall be submitted to the Engineer at least five working days prior to the start of asphalt concrete production. Mix designs provided by the agency may be utilized on projects at the Engineer's discretion. The Engineer will review and approve the mix design to assure it contains all of the required information as outlined in Section 710.3.1. The target values for gradations, binder contents, and air voids will be established as the accepted Job Mix Formula (JMF) based upon the mix design. Mix designs not containing all of the information will be returned within five working days of receipt of all mix design information, for action and resubmission by the contractor.

## SECTION 321

Once the mix design has been approved by the agency and the mixing plant selected, the Contractor and/or his supplier shall not change plants nor utilize additional mixing plants without prior approval of the Engineer.

If the contractor elects to change its source of material, the contractor shall furnish the Engineer with a new mix design, which meets the requirements of Section 710, as amended by the Project Specifications.

The contractor may make self-directed target changes to the approved mix design within the limits shown below. Requests for self-directed target changes shall be made in writing and acknowledged by the Engineer prior to the start of production of a lot and will remain in effect until such time as any additional changes are implemented.

The self-directed target changes must meet the contract requirements for mix design criteria and gradation limits.

<b>TABLE 321-1 ALLOWABLE SELF-DIRECTED TARGET CHANGES</b>	
<b>MEASURED CHARACTERISTICS</b>	<b>ALLOWABLE SELF-DIRECTED TARGET CHANGES</b>
Gradation (Sieve Size)	
3/8 inch	+ 2% from mix design target value
No 8	+ 2% from mix design target value
No 30	+ 1% from mix design target value
No 200	None
Binder Content	+ 0.2% from mix design target value
Effective Air Voids	None

The contractor may propose target changes, other than self-directed changes, to the approved mix design for the approval of the Engineer. The Engineer will determine if the proposed target change will result in mix production that meets the contract requirements for mix design criteria and gradation limits. The target changes will not be retroactive for the purpose of acceptance.

### 321.6 MIX PRODUCTION:

All materials shall be proportioned by weight in a hot mix asphalt plant in the proportions required by the mix design to provide a homogeneous and workable mass. Each hot mix asphalt plant shall be inspected in accordance with the provisions contained in the 'Hot Mix Asphalt Production Facilities' by the Arizona Rock Products Association and shall have a current inspection certificate. Mixing plants shall conform to the requirements of AASHTO M 156, except as modified herein. .

In drum mix plants the mineral admixture shall be added and thoroughly mixed with the mineral aggregate by means of a mechanical mixing device prior to the mineral aggregate and mineral admixture entering the dryer. The moisture content of the combined mineral aggregate shall be a minimum of three percent by weight of the aggregate during the mixing process.

For drum-mix plants, the mineral admixture shall be weighed across a weigh belt, or other approved alternative weighing system, with a weight totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer that is in good working condition. The rate of the aggregate feed shall not exceed the mixing device's capacity in ton per hour. The mixer shall be constructed to minimize the loss of mineral admixture and shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected. The mixing device shall be capable of effective mixing in the full range of the asphalt concrete production rates.

The hot plant and equipment shall be constructed and operated to prevent loss of mineral admixture through the dust collection system of the plant.

## SECTION 321

A positive signal system shall be provided and utilized during production whereby the mixing shall automatically be stopped if the mineral admixture is not introduced into the mineral aggregate. The plant will not be permitted to operate unless the signal system is in good working condition.

The introduction of bituminous material shall be controlled by an automated system fully integrated with the controls or the mineral aggregate and mineral admixture. The production of the plant shall be controlled by the rate required to obtain a uniform mixture of all components. Drying and heating shall be accomplished in such a manner as to preclude the mineral admixture from becoming coated with un-spent fuel. The completed asphalt concrete may be held in storage for up to 12 hours in insulated or heated silos, providing the minimum temperature noted herein for placement and compaction is met behind the placement device. If the Engineer determines that there is an excessive amount of heat, heat loss, drain down, segregation and/or oxidation of the mixture due to temporary storage, use of surge bins or storage bins will be discontinued.

The temperature of the asphalt concrete, with unmodified binders, upon discharge from the mixer shall not exceed 335 degrees F. The discharge temperature may be increased on the recommendation of the binder supplier, when approved by the Engineer. If the asphalt concrete is discharged from the mixer into a hopper, the hopper shall be constructed so that segregation of the asphalt concrete will be minimized.

### 321.7 TRANSPORTATION:

The use of petroleum distillates or other substances that will have a detrimental effect on the asphalt concrete shall not be used as a release agent.

The beds of all transportation units shall be clean and smooth to allow the free flow of material into the paving machine's hopper.

Tarpaulins shall be furnished at all times

### 321.8 PLACEMENT:

#### 321.8.1 Placing

All courses of asphalt concrete shall be placed and finished by means of a self-propelled paving machine equipped with an automatically actuated control system, except under certain conditions or at locations where the Engineer deems the use of a self-propelled paving machine impracticable.

The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other end indirectly either through controlling the transverse slope or alternatively when directed, by controlling the elevation of each end independently.

The control system shall be capable of working with one of the following devices:

- (A) Ski or non-contact device of not less than 30 feet in length, supported throughout its entire length
- (B) Taut stringline or wire set to grade
- (C) Short ski or sonar sensing units from curb control
- (D) Joint matching shoe

Failure of the control system to function properly shall be cause for the suspension of asphalt concrete production. In order to achieve a continuous operation, the speed of the paving machine shall be coordinated with the hot mix plant and transport units.

If the asphalt concrete is dumped from the hauling vehicles directly into the paving machine, care shall be taken to avoid jarring the machine or moving it out of alignment. No vertical load shall be exerted on the paving machine by the truck.

## SECTION 321

If asphalt concrete is dumped upon the surface being paved and subsequently loaded in the paving machine, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphalt concrete shall be picked up and loaded into the paving machine.

Self-propelled paving machines shall spread the mixture without segregation or tearing, true to line, grade and crown indicated on the Project plans. Pavers shall be equipped with hoppers and augers that will distribute the mixture uniformly in front of an adjustable floating screed. Care should be utilized when operating the paving machine. The raising of the hopper wings should be minimized and the paving machine should not be operated when in an empty or near-empty condition.

Screeds shall include any strike-off device operated by tamping or vibrating action which is effective, without tearing, shoving or gouging the mixture and which produces a course with a uniform texture and density for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.

At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers to provide a uniform and smooth layer over the entire area compacted in this manner.

### **321.8.2 Joints:**

Transverse joints, before a surface course is placed in contact with a cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth and exposing a fresh face. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline.

Longitudinal Joints of each course shall be staggered a minimum of 6 inches with relation to the longitudinal joint of the immediate underlying course cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth and exposing a fresh face. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline. The joint will be tack coated if required by the engineer.

### **321.8.3 Leveling Course**

A leveling course shall be used when specified, or as directed in writing by the Engineer, to bring existing pavement to a uniform grade prior to placing an overlay or other course. The compaction requirements contained in Section 321.10 do not apply to leveling courses.

### **321.8.4 Compaction Base and Surface**

It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during compaction operations to achieve the required compaction. Asphalt concrete immediately behind the laydown machine shall be a minimum of 250 degrees F as measured from a probe type thermocouple thermometer that has been calibrated to an AASHTO standard. The probe type thermocouple thermometer shall have a current calibration sticker attached. When measuring the temperature of the mat, the probe shall be inserted at mid-depth and as horizontal as possible to the mat.

Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the project requirements.

Pneumatic tired compactors shall be equipped with skirt-type devices mounted around the tires so that the temperature of the tires will be maintained during the compaction process.

The Engineer will determine the acceptability of the pavement compaction in accordance with Section 321.10 – "Acceptance".



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### **321.8.5 Smoothness:**

The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than one-fourth ( $\frac{1}{4}$ ) inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway.

### **321.9 QUALITY CONTROL:**

It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during asphalt concrete production to achieve the required compaction and to perform any desired Quality Control monitoring and/or testing during asphalt concrete production to achieve the required mix properties. The Engineer may obtain samples of any portion of any material at any point of the operations for his own use. Also, the Engineer may order the use of any drying, proportioning and mixing equipment or the handling of any material discontinued which, in his/her opinion, fails to produce a satisfactory mixture.

The asphalt concrete produced shall conform to the properties of the mix design. When the asphalt concrete does not conform to the approved mix design properties, it shall be reported to the Engineer, and corrective quality control measures shall be implemented, or production shall cease immediately at no additional cost to the contracting Agency or Engineer.

### **321.10 ACCEPTANCE:**

#### **321.10.1 Acceptance Criteria:**

Unless otherwise specified, asphalt concrete will be divided into lots for the purpose of acceptance. A lot shall be considered to be one day's production. When the quantity of asphalt concrete placed in a day exceeds 500 tons but is less than 2000 tons, the lot shall be divided into 500 ton sublots or fraction thereof. Where the quantity of asphalt concrete placed in a day exceeds 2000 tons, the day's production will be divided into four (4) approximately equal sublots. A minimum of one sample will be obtained from each lot. Tests used to determine acceptance will be performed by the Engineer or a laboratory employed by the Engineer. In either case the laboratory shall be accredited by the AASHTO Accreditation Program (AAP), for the tests being performed. The acceptance laboratory will take representative samples of the asphalt concrete from each subplot to allow for gradation, binder content, air voids, pavement thickness and compaction of base and surface course. Each subplot will be accepted based upon the test data from the sample(s) from that subplot. All acceptance samples shall be taken using random locations or times designated by the Engineer in accordance with ASTM D 3665.

#### **321.10.2 Gradation, Binder Content and Air Voids:**

The acceptance laboratory will take a sample of the asphalt concrete in accordance with the requirements of Section 2 or 4 of Arizona Test Methods 104 or AASHTO T168 from each subplot. The minimum weight of the sample shall be 45 pounds. Asphalt binder content and gradation shall be determined in accordance with AASHTO T308 using the ignition furnace for each subplot. The acceptance laboratory is responsible for obtaining the necessary materials and performing an ignition furnace calibration as outlined in AASHTO T308 for each asphalt concrete mixture utilized on the project. The correction factor used for each test shall be clearly indicated on the report. The bulk density for Marshall Mix designs shall be tested in accordance with AASHTO T245. The bulk density for Gyratory mix designs shall be tested in accordance with AASHTO T312. The maximum theoretical density shall be tested in accordance with the requirements of AASHTO T209. Effective voids determined on the laboratory compacted specimens will be determined at a minimum of once per lot in accordance with the requirements of AASHTO T269. Should the testing for effective air voids not meet the "Full Payment" or "No Corrective Action" requirements of Table 321-5, additional testing for laboratory air voids on the remaining sublots will be performed as necessary to determine the extent of the deficiency. Acceptance testing results will be furnished to the contractor within five working days of receipt of samples by the acceptance laboratory.

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The allowable deviations for acceptable production of each measured characteristic from the values established in the JMF for each subplot are as follows:

<b>TABLE 321-3</b>	
<b>ACCEPTANCE LIMITS FOR ASPHALT CONCRETE</b>	
Maximum Aggregate Size	100% passing
Nominal Maximum Aggregate Size	±7%
No. 8 Sieve to the Nominal Maximum Aggregate Size	±6%
No. 100 and No. 30 Sieves	±4%
No. 200 Sieve	±2%

If the results from a single acceptance sample fall outside of the acceptance limits in Table 321-3 a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits in Table 321-3 production of asphalt concrete shall cease. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in table 321-3.

<b>TABLE 321-4</b>		
<b>ASPHALT BINDER CONTENT CORRECTIVE ACTION FOR DEVIATIONS</b>		
Deviation from that permitted	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
0.0 to 0.1% points	\$2.00	EA (see 321.10.6)
Over 0.1 to 0.2% points	\$6.00	EA (see 321.10.6)
Over 0.2% points	Removal*	Removal*

Note: Removal\* refers to Section 321-10.6

<b>TABLE 321-5</b>		
<b>LABORATORY VOIDS ACCEPTANCE AND PENALTIES</b>		
Laboratory Air Voids (Measured at N <sub>des</sub> or 75 blows as applicable)	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Less than 1.5%	Removal*	Removal*
1.5-2.0%	\$2.50	EA (see 321.10.6)
2.1-2.7%	\$1.00	EA (see 321.10.6)
2.8-6.2%	Full Payment	No corrective action
6.3-6.9%	\$1.00	EA (see 321.10.6)
7.0-8.0%	\$2.50	EA (see 321.10.6)
Greater than 8.0%	Removal*	Removal*

Note: Removal\* refers to Section 321-10.6

## SECTION 321

If an agency or Engineer is purchasing asphalt concrete directly from a commercial material supplier, the agency or Engineer will use Section 321.10 and specifically tables 321-3, 321-4 and 321-5 from Section 321.10 when determining the acceptance of the asphalt concrete with the material supplier.

### **321.10.3 Surface Drainage:**

If directed by the Engineer surface drainage test shall be performed. The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.

All streets shall be water tested for drainage in the presence of the Engineer or designated representative before final acceptance. Any areas not draining properly shall be corrected to the Engineer's satisfaction at the Contractor's expense. Water for this testing shall be provided and paid for by the Contractor.

When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

### **321.10.4 Asphalt Pavement Thickness:**

Asphalt Pavement thickness will be determined from cores secured from each subplot for this purpose. Such cores will be taken and measured by the Asphalt Concrete Coring Method. This method can be found at [www.azrockproducts.org](http://www.azrockproducts.org) or [www.azagc.org](http://www.azagc.org) websites. Each core location will be patched by the party responsible for the testing.

If the pavement thickness is deficient from the target thickness by 0.25 inches or less, it will be paid for at the contract unit price. If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is not the owner (i.e. permits) the following steps will apply:

1. If the thickness deficiency of the pavement exceeds 0.25 inch, the limits of the deficient area will be isolated by coring at maximum intervals of 100 feet from the deficient core. The thicknesses of the original deficient core will be averaged with the thicknesses of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements.
2. If the pavement thickness from step one above deviates from the target thickness by more than 0.25 inch but not more than 0.50 inch, corrective action will be required. This corrective action will consist of application of a Type II slurry seal coat in accordance to Section 715. The Contractor may present an engineering analysis outlining other proposed remedial measures for the consideration of the Engineer. The Engineer will review the engineering analysis and decide within 30 working days whether to accept the proposed remedial measures.
3. If the pavement thickness from step one above deviates from the target thickness by more than 0.50 inch, corrective action will be required. The deficient area will be overlaid for the full width of the pavement to meet or exceed the designed thickness, with the appropriate end and edge milling, with a mixture approved by the Engineer. The Contractor may present an engineering analysis outlining other proposed remedial measures for the Engineer's consideration. The Engineer will review the engineering analysis and decide within 10 working days whether to accept the proposed remedial measures. If the Engineer chooses to reject the engineering analysis, the indicated overlay will be constructed by the Contractor at no additional cost to the Owner.

## SECTION 321

If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is the owner, Table 321-2 will apply.

TABLE 321-6	
ASPHALT PAVEMENT THICKNESS PAYMENT REDUCTION For Thickness Deficiency of More Than 0.25 inches and less than 0.50 inches	
Specified Mat Thickness	Reduction in Payment or Corrective Action
Less than 1.5 inches	50%
1.50 inches to 1.99 inches	33%
2.00 inches to 2.49 inches	25%
2.50 inches to 2.99 inches	20%
3.00 inches and over	17%

### 321.10.5 Density:

Achieving the required compaction is the responsibility of the contractor. The number and types of rollers is the contractor's responsibility and shall be sufficient to meet these requirements.

In-place air voids shall be determined in accordance with AASHTO T269 utilizing cores taken from the finished pavement. The maximum theoretical density used in the determination of in-place air voids will be the average value from the acceptance samples determined for the Lot as outlined in 321.10.1.

The Engineer will designate two random test locations for each subplot and the acceptance laboratory will obtain two cores from each location. The two cores will be averaged for acceptance. The outside one foot of each pass of the pavement course or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

Cores will be taken per the Asphalt Concrete Coring Method. This method can be found at [www.azrockproducts.org](http://www.azrockproducts.org) or [www.azagc.org](http://www.azagc.org) websites. The acceptance laboratory will furnish test results within 3 working days of receipt of the cores.

If the pavement density has in-place voids of 8.0% or less, the asphalt concrete will be paid for at the contract unit price. If the pavement density has in-place voids greater than 8.0%, the limits of the deficient area will be isolated within the subplot by coring at maximum intervals of 100 feet from the deficient core. The in-place voids of the original deficient core will be averaged with the in-place voids of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements. If the average of the in-place voids is greater than 8.0% then Table 321-6 shall apply to the subplot.

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TABLE 321-7		
PAVEMENT DENSITY PENALTIES		
Limits of In-place Air Voids	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
8.1% to 9.0%	\$4.00	EA
9.1% to 10.0%	\$6.00	EA and Type II Surry Seal
10.1% to 11.0%	Removal*	Removal*
Greater than 11.0%	Removal	Removal

\*Notes: Removal\* refers to Section 321-10.6. The Contractor shall remove and replace the entire subplot that is deficient. Removal for In-place Air Voids greater than 11.0% is not eligible for Section 321.10.6.

### 321.10.6 Engineering Analysis (EA):

Within 10 working days after receiving notice that a subplot of asphalt concrete is deficient for “Removal” by the Engineer, the contractor may submit a written proposal (Engineering Analysis) to accept the material in place at the applicable penalties listed in the “Removal” category. Engineering Analysis can also be proposed for non-removal categories of “Corrective actions” when the contracting agency is not the owner (i.e. permits).

The Engineering Analysis shall contain an analysis of the anticipated performance of the asphalt concrete if left in place. The Engineering Analysis shall also detail the effect of any proposed corrective action on the performance. The Engineering Analysis shall be performed by a professional engineer experienced in asphalt concrete testing and mix designs. If the subplot is submitted for referee testing by the contractor, the ten working days allowed to prepare an engineering analysis will begin upon notification of referee test results.

When an Engineering Analysis recommends that a specific lot or subplot not be removed, the Engineering Analysis will recommend that the following penalties (Table 321-8) be paid when the contracting agency is the owner, for the specific criteria being reviewed by the EA.

TABLE 321-8		
ENGINEERING ANALYSIS PENALTIES for REMOVAL* LOTS/SUBLOTS LEFT IN-PLACE		
Acceptance Criteria	Acceptance Limits	Penalty When Contracting Agency is the Owner (\$/Ton)
Asphalt Binder Content	Over 0.2% points from that Permitted	\$9.00
Laboratory Air Voids (Measured at $N_{des}$ or 75 blows as applicable)	Less than 1.5% or Greater Than 8.0%	\$3.75
Limits of In-place Air Voids	10.1% to 11.0%	\$9.00

Within 15 working days, the Engineer will determine whether or not to accept the contractor’s proposed Engineering Analysis.

## **SECTION 321**

### **321.11 REFEREE:**

In the event the contractor elects to question the acceptance test results for a subplot, the Contractor may make a written request for additional testing of that subplot. The Contractor will engage an independent laboratory (at the Contractor's own expense) who is accredited by AAP in all of the acceptance tests. The independent laboratory shall be acceptable to the Engineer and shall perform a complete new set of acceptance tests (as required by Section 321.10 representing the area or set of tests in question).

These tests shall include asphalt binder content, aggregate gradation, Marshall or Gyratory unit weight, and maximum theoretical unit weight. Samples for referee testing shall come from representative samples obtained from the completed pavement, as directed by the Engineer.

The number of samples taken will be the same as specified in Section 321.10. The independent laboratory shall compile the test results and transmit them to both the Engineer and the Contractor. The independent laboratory shall include a letter signed by an Engineer registered in the State of Arizona, who is experienced in asphalt concrete testing and mix designs. The signed letter shall give an opinion that the material evaluated either does or does not comply with project specifications, and shall clearly describe any deficiencies, and the results will be binding between all parties.

### **321.12 MEASUREMENT:**

Asphalt concrete pavement will be measured by the ton, or by the square yard, for the mixture actually used as allowed above, which shall include the required quantities of mineral aggregates, asphalt binder, and mineral admixture. Measurement shall include any tonnage used to construct intersections, roadways, streets, or other miscellaneous surfaces indicated on the plans or as directed by the Engineer.

### **321.13 PAYMENT:**

The asphalt concrete measured as provided above will be paid for at the contract price per ton or square yard, as adjusted per Section 321.10 ACCEPTANCE, which price shall be full compensation for the item complete, as herein described and specified.

Payment for tack coat will be by the ton diluted, based on the rate of application, as directed by the Engineer.

No payment will be made for any overrun in quantity of asphalt concrete in excess of 10 percent based on actual field measurement of area covered, design thickness, and the mix design unit weight. The calculations and payment for overrun will be by individual bid item. To compensate or adjust for a thickness deficiency in an underlying asphalt concrete course, the Engineer may authorize a quantity increase in excess of 10 percent for a subsequent asphalt concrete course. In such cases, the quantity in excess of 10 percent will be paid for at the lowest unit bid price.

Except as otherwise specified in the special provisions, no separate payment will be made for work necessary to construct miscellaneous items or surfaces of asphalt concrete.

## SECTION 321

Revised 4-10-08

## ASPHALT CONCRETE PAVEMENT

## 321.1 DESCRIPTION:

This section is to provide specifications for furnishing all materials, mixing at a plant, hauling and placing a mixture of aggregate materials, mineral admixture and asphalt binder to form a pavement course for the following situations or projects

- A capital improvement project where the work is being performed under a contract directly between the contractor and the Owner.
- A project being constructed under a permit, where the Owner's control and responsibility for maintenance will eventually be transferred upon dedication of the project or roadway to a city, county, or other entity.
- A project where the Owner is a private individual, company, or group and no city, county or other agency specifications apply to the project.

## 321.2 MATERIALS AND MANUFACTURE:

The materials shall conform to Section 710 for the type specified. The specific required mix type shall be called out in the contract documents or as directed by the Engineer.

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## 321.3 WEATHER AND MOISTURE CONDITIONS:

Asphalt concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 40 degrees F. or above. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base on which the material is to be placed contains excessive moisture and is unstable. Excessive moisture is defined as the base or subgrade moisture is in excess of 2 percent above optimum moisture, determined in accordance with AASHTO T 99 corrected for the appropriate rock percentage. Asphalt concrete shall be placed only when the Engineer determines that weather conditions are suitable.

Deleted: Owner's Engineer

## 321.4 APPLICATION OF TACK COAT:

A tack coat shall be applied to all existing and to each new course of asphalt concrete prior to the placing of a succeeding lift of asphalt concrete. The tack coat may be deleted when a succeeding layer of asphalt concrete is being applied over a freshly laid course that has been subjected to very little traffic when approved by the Engineer.

Deleted: Owner's Engineer

The application of the tack coat shall comply with Section 329. The grade of emulsified asphalt shall be SS-1 h or CSS-1h as specified in Section 713.

The same material that is specified above for the tack coat shall be applied to the vertical surfaces of existing pavements, curbs, and gutters, against which asphalt concrete is to be placed.

The surface to be covered may require repair or patching as directed by the Engineer. This shall be addressed in the project specifications prior to the bidding of the project.

Deleted: Owner's Engineer

## 321.5 MIX DESIGN

The mix design shall be submitted to the Engineer at least five working days prior to the start of asphalt concrete production. Mix designs provided by the agency may be utilized on projects at the Engineer's discretion. The Engineer will review and approve the mix design to assure it contains all of the required information as outlined in Section 710.3.1. The target values for gradations, binder contents, and air voids will be established as the accepted Job Mix Formula (JMF) based upon the mix design. Mix designs not containing all of the information will be returned within five working days of receipt of all mix design information, for action and resubmission by the contractor.

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## SECTION 321

Once the mix design has been approved by the agency and the mixing plant selected, the Contractor and/or his supplier shall not change plants nor utilize additional mixing plants without prior approval of the Engineer.

If the contractor elects to change its source of material, the contractor shall furnish the Engineer with a new mix design, which meets the requirements of Section 710, as amended by the Project Specifications.

Deleted: Owner's Engineer

The contractor may make self-directed target changes to the approved mix design within the limits shown below. Requests for self-directed target changes shall be made in writing and acknowledged by the Engineer prior to the start of production of a lot and will remain in effect until such time as any additional changes are implemented.

Deleted: Owner's Engineer

The self-directed target changes must meet the contract requirements for mix design criteria and gradation limits.

TABLE 321-1 ALLOWABLE SELF-DIRECTED TARGET CHANGES	
MEASURED CHARACTERISTICS	ALLOWABLE SELF-DIRECTED TARGET CHANGES
Gradation (Sieve Size)	
3/8 inch	+ 2% from mix design target value
No 8	+ 2% from mix design target value
No 30	+ 1% from mix design target value
No 200	None
Binder Content	+ 0.2% from mix design target value
Effective Air Voids	None

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The contractor may propose target changes, other than self-directed changes, to the approved mix design for the approval of the Engineer. The Engineer will determine if the proposed target change will result in mix production that meets the contract requirements for mix design criteria and gradation limits. The target changes will not be retroactive for the purpose of acceptance.

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### 321.6 MIX PRODUCTION:

All materials shall be proportioned by weight in a hot mix asphalt plant in the proportions required by the mix design to provide a homogeneous and workable mass. Each hot mix asphalt plant shall be inspected in accordance with the provisions contained in the 'Hot Mix Asphalt Production Facilities' by the Arizona Rock Products Association and shall have a current inspection certificate. Mixing plants shall conform to the requirements of AASHTO M 156, except as modified herein.

In drum mix plants the mineral admixture shall be added and thoroughly mixed with the mineral aggregate by means of a mechanical mixing device prior to the mineral aggregate and mineral admixture entering the dryer. The moisture content of the combined mineral aggregate shall be a minimum of three percent by weight of the aggregate during the mixing process.

For drum-mix plants, the mineral admixture shall be weighed across a weigh belt, or other approved alternative weighing system, with a weight totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer that is in good working condition. The rate of the aggregate feed shall not exceed the mixing device's capacity in ton per hour. The mixer shall be constructed to minimize the loss of mineral admixture and shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected. The mixing device shall be capable of effective mixing in the full range of the asphalt concrete production rates.

The hot plant and equipment shall be constructed and operated to prevent loss of mineral admixture through the dust collection system of the plant.

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## SECTION 321

A positive signal system shall be provided and utilized during production whereby the mixing shall automatically be stopped if the mineral admixture is not introduced into the mineral aggregate. The plant will not be permitted to operate unless the signal system is in good working condition.

The introduction of bituminous material shall be controlled by an automated system fully integrated with the controls or the mineral aggregate and mineral admixture. The production of the plant shall be controlled by the rate required to obtain a uniform mixture of all components. Drying and heating shall be accomplished in such a manner as to preclude the mineral admixture from becoming coated with un-spent fuel. The completed asphalt concrete may be held in storage for up to ~~12~~ hours in insulated or heated silos, providing the minimum temperature noted herein for placement and compaction is met behind the placement device. ~~If the Engineer determines that there is an excessive amount of heat, heat loss, drain down, segregation and/or oxidation of the mixture due to temporary storage, use of surge bins or storage bins will be discontinued~~

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The temperature of the asphalt concrete, with unmodified binders, upon discharge from the mixer shall not exceed 335 degrees F. The discharge temperature may be increased on the recommendation of the binder supplier, when approved by the ~~Engineer~~. If the asphalt concrete is discharged from the mixer into a hopper, the hopper shall be constructed so that segregation of the asphalt concrete will be minimized.

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### 321.7 TRANSPORTATION:

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The use of petroleum distillates or other substances that will have a detrimental effect on the asphalt concrete shall not be used as a release agent.

The beds of all transportation units shall be clean and smooth to allow the free flow of material into the paving machine's hopper.

Tarpaulins shall be furnished ~~at all times~~

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### 321.8 PLACEMENT:

#### 321.8.1 Placing

All courses of asphalt concrete shall be placed and finished by means of a self-propelled paving machine equipped with an automatically actuated control system, except under certain conditions or at locations where the ~~Engineer~~ deems the use of a self-propelled paving machine impracticable.

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The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other end indirectly either through controlling the transverse slope or alternatively when directed, by controlling the elevation of each end independently.

The control system shall be capable of working with one of the following devices:

- (A) Ski or non-contact device of not less than 30 feet in length, supported throughout its entire length
- (B) Taut stringline or wire set to grade
- (C) Short ski or sonar sensing units from curb control
- (D) Joint matching shoe

Failure of the control system to function properly shall be cause for the suspension of asphalt concrete production. In order to achieve a continuous operation, the speed of the paving machine shall be coordinated with the hot mix plant and transport units.

If the asphalt concrete is dumped from the hauling vehicles directly into the paving machine, care shall be taken to avoid jarring the machine or moving it out of alignment. No vertical load shall be exerted on the paving machine by the truck.

## SECTION 321

If asphalt concrete is dumped upon the surface being paved and subsequently loaded in the paving machine, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphalt concrete shall be picked up and loaded into the paving machine.

Self-propelled paving machines shall spread the mixture without segregation or tearing, true to line, grade and crown indicated on the Project plans. Pavers shall be equipped with hoppers and augers that will distribute the mixture uniformly in front of an adjustable floating screed. Care should be utilized when operating the paving machine. The raising of the hopper wings should be minimized and the paving machine should not be operated when in an empty or near-empty condition.

Screeds shall include any strike-off device operated by tamping or vibrating action which is effective, without tearing, shoving or gouging the mixture and which produces a course with a uniform texture and density for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.

At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers to provide a uniform and smooth layer over the entire area compacted in this manner.

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### 321.8.2 Joints:

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Transverse joints, before a surface course is placed in contact with a cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth and exposing a fresh face. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than  $\frac{1}{4}$  inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline.

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Longitudinal Joints of each course shall be staggered a minimum of 6 inches with relation to the longitudinal joint of the immediate underlying course cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth and exposing a fresh face. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than  $\frac{1}{4}$  inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline. The joint will be tack coated if required by the engineer.

### 321.8.3 Leveling Course

A leveling course shall be used when specified, or as directed in writing by the Engineer, to bring existing pavement to a uniform grade prior to placing an overlay or other course. The compaction requirements contained in Section 321.10 do not apply to leveling courses.

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### 321.8.4 Compaction Base and Surface

It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during compaction operations to achieve the required compaction. Asphalt concrete immediately behind the laydown machine shall be a minimum of 250 degrees F as measured from a probe type thermocouple thermometer that has been calibrated to an AASHTO standard. The probe type thermocouple thermometer shall have a current calibration sticker attached. When measuring the temperature of the mat, the probe shall be inserted at mid-depth and as horizontal as possible to the mat.

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Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the project requirements.

Pneumatic tired compactors shall be equipped with skirt-type devices mounted around the tires so that the temperature of the tires will be maintained during the compaction process.

The Engineer will determine the acceptability of the pavement compaction in accordance with Section 321.10 - "Acceptance".

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## SECTION 321

### 321.8.5 Smoothness:

The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than one-fourth (1/4) inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway.

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### 321.9 QUALITY CONTROL:

It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during asphalt concrete production to achieve the required compaction and to perform any desired Quality Control monitoring and/or testing during asphalt concrete production to achieve the required mix properties. The Engineer may obtain samples of any portion of any material at any point of the operations for his own use. Also, the Engineer may order the use of any drying, proportioning and mixing equipment or the handling of any material discontinued which, in his/her opinion, fails to produce a satisfactory mixture.

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The asphalt concrete produced shall conform to the properties of the mix design. When the asphalt concrete does not conform to the approved mix design properties, it shall be reported to the Engineer, and corrective quality control measures shall be implemented, or production shall cease immediately at no additional cost to the contracting Agency or Engineer.

### 321.10 ACCEPTANCE:

#### 321.10.1 Acceptance Criteria:

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Unless otherwise specified, asphalt concrete will be divided into lots for the purpose of acceptance. A lot shall be considered to be one day's production. When the quantity of asphalt concrete placed in a day exceeds 500 tons but is less than 2000 tons, the lot shall be divided into 500 ton sublots or fraction thereof. Where the quantity of asphalt concrete placed in a day exceeds 2000 tons, the day's production will be divided into four (4) approximately equal sublots. A minimum of one sample will be obtained from each lot. Tests used to determine acceptance will be performed by the Engineer or a laboratory employed by the Engineer. In either case the laboratory shall be accredited by the AASHTO Accreditation Program (AAP), for the tests being performed. The acceptance laboratory will take representative samples of the asphalt concrete from each subplot to allow for gradation, binder content, air voids, pavement thickness and compaction of base and surface course. Each subplot will be accepted based upon the test data from the sample(s) from that subplot. All acceptance samples shall be taken using random locations or times designated by the Engineer in accordance with ASTM D 3665.

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#### 321.10.2 Gradation, Binder Content and Air Voids:

The acceptance laboratory will take a sample of the asphalt concrete in accordance with the requirements of Section 2 or 4 of Arizona Test Methods 104 or AASHTO T168 from each subplot. The minimum weight of the sample shall be 45 pounds. Asphalt binder content and gradation shall be determined in accordance with AASHTO T308 using the ignition furnace for each subplot. The acceptance laboratory is responsible for obtaining the necessary materials and performing an ignition furnace calibration as outlined in AASHTO T308 for each asphalt concrete mixture utilized on the project. The correction factor used for each test shall be clearly indicated on the report. The bulk density for Marshall Mix designs shall be tested in accordance with AASHTO T245. The bulk density for Gyratory mix designs shall be tested in accordance with AASHTO T312. The maximum theoretical density shall be tested in accordance with the requirements of AASHTO T209. Effective voids determined on the laboratory compacted specimens will be determined at a minimum of once per lot in accordance with the requirements of AASHTO T269. Should the testing for effective air voids not meet the "Full Payment" or "No Corrective Action" requirements of Table 321-5, additional testing for laboratory air voids on the remaining sublots will be performed as necessary to determine the extent of the deficiency. Acceptance testing results will be furnished to the contractor within five working days of receipt of samples by the acceptance laboratory.

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## SECTION 321

The allowable deviations for acceptable production of each measured characteristic from the values established in the JMF for each subplot are as follows:

TABLE 321-3	
ACCEPTANCE LIMITS FOR ASPHALT CONCRETE	
Maximum Aggregate Size	100% passing
Nominal Maximum Aggregate Size	±7%
No. 8 Sieve to the Nominal Maximum Aggregate Size	±6%
No. 100 and No. 30 Sieves	±4%
No. 200 Sieve	±2%

If the results from a single acceptance sample fall outside of the acceptance limits in Table 321-3 a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits in Table 321-3 production of asphalt concrete shall cease. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in table 321-3.

**Deleted:** the results of an asphalt concrete mix sample fall within the acceptance limits in Table 321-3.

TABLE 321-4		
ASPHALT BINDER CONTENT CORRECTIVE ACTION FOR DEVIATIONS		
Deviation from that permitted	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
0.0 to 0.1% points	\$2.00	EA (see 321.10.6)
Over 0.1 to 0.2% points	\$6.00	EA (see 321.10.6)
Over 0.2% points	Removal*	Removal*

Note: Removal\* refers to Section 321-10.6

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TABLE 321-5		
LABORATORY VOIDS ACCEPTANCE AND PENALTIES		
Laboratory Air Voids (Measured at N <sub>des</sub> or 75 blows as applicable)	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Less than 1.5%	Removal*	Removal*
1.5-2.0%	\$2.50	EA (see 321.10.6)
2.1-2.7%	\$1.00	EA (see 321.10.6)
2.8-6.2%	Full Payment	No corrective action
6.3-6.9%	\$1.00	EA (see 321.10.6)
7.0-8.0%	\$2.50	EA (see 321.10.6)
Greater than 8.0%	Removal*	Removal*

Note: Removal\* refers to Section 321-10.6

## SECTION 321

If an agency or Engineer is purchasing asphalt concrete directly from a commercial material supplier, the agency or Engineer will use Section 321.10 and specifically tables 321-3, 321-4 and 321-5 from Section 321.10 when determining the acceptance of the asphalt concrete with the material supplier.

### 321.10.3 Surface Drainage:

If directed by the Engineer surface drainage test shall be performed. The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.

All streets shall be water tested for drainage in the presence of the Engineer or designated representative before final acceptance. Any areas not draining properly shall be corrected to the Engineer's satisfaction at the Contractor's expense. Water for this testing shall be provided and paid for by the Contractor.

When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

### 321.10.4 Asphalt Pavement Thickness:

Asphalt Pavement thickness will be determined from cores secured from each subplot for this purpose. Such cores will be taken and measured by the Asphalt Concrete Coring Method. This method can be found at [www.azrockproducts.org](http://www.azrockproducts.org) or [www.azagc.org](http://www.azagc.org) websites. Each core location will be patched by the party responsible for the testing.

If the pavement thickness is deficient from the target thickness by 0.25 inches or less, it will be paid for at the contract unit price. If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is not the owner (i.e. permits) the following steps will apply:

1. If the thickness deficiency of the pavement exceeds 0.25 inch, the limits of the deficient area will be isolated by coring at maximum intervals of 100 feet from the deficient core. The thicknesses of the original deficient core will be averaged with the thicknesses of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements.
2. If the pavement thickness from step one above deviates from the target thickness by more than 0.25 inch but not more than 0.50 inch, corrective action will be required. This corrective action will consist of application of a Type II slurry seal coat in accordance to Section 715. The Contractor may present an engineering analysis outlining other proposed remedial measures for the consideration of the Engineer. The Engineer will review the engineering analysis and decide within 30 working days whether to accept the proposed remedial measures.
3. If the pavement thickness from step one above deviates from the target thickness by more than 0.50 inch, corrective action will be required. The deficient area will be overlaid for the full width of the pavement to meet or exceed the designed thickness, with the appropriate end and edge milling, with a mixture approved by the Engineer. The Contractor may present an engineering analysis outlining other proposed remedial measures for the Engineer's consideration. The Engineer will review the engineering analysis and decide within 10 working days whether to accept the proposed remedial measures. If the Engineer chooses to reject the engineering analysis, the indicated overlay will be constructed by the Contractor at no additional cost to the Owner.

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## SECTION 321

If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is the owner, Table 321-2 will apply.

TABLE 321-6	
ASPHALT PAVEMENT THICKNESS PAYMENT REDUCTION For Thickness Deficiency of More Than 0.25 inches and less than 0.50 inches	
Specified Mat Thickness	Reduction in Payment or Corrective Action
Less than 1.5 inches	50%
1.50 inches to 1.99 inches	33%
2.00 inches to 2.49 inches	25%
2.50 inches to 2.99 inches	20%
3.00 inches and over	17%

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### 321.10.5 Density:

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Achieving the required compaction is the responsibility of the contractor. The number and types of rollers is the contractor's responsibility and shall be sufficient to meet these requirements.

In-place air voids shall be determined in accordance with AASHTO T269 utilizing cores taken from the finished pavement. The maximum theoretical density used in the determination of in-place air voids will be the average value from the acceptance samples determined for the Lot as outlined in 321.10.1.

The Engineer will designate two random test locations for each subplot and the acceptance laboratory will obtain two cores from each location. The two cores will be averaged for acceptance. The outside one foot of each pass of the pavement course or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

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The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

Cores will be taken per the Asphalt Concrete Coring Method. This method can be found at [www.azrockproducts.org](http://www.azrockproducts.org) or [www.azagc.org](http://www.azagc.org) websites. The acceptance laboratory will furnish test results within 3 working days of receipt of the cores.

If the pavement density has in-place voids of 8.0% or less, the asphalt concrete will be paid for at the contract unit price. If the pavement density has in-place voids greater than 8.0%, the limits of the deficient area will be isolated within the subplot by coring at maximum intervals of 100 feet from the deficient core. The in-place voids of the original deficient core will be averaged with the in-place voids of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements. If the average of the in-place voids is greater than 8.0% then Table 321-6 shall apply to the subplot.

# SECTION 321

TABLE 321-7		
PAVEMENT DENSITY PENALTIES		
Limits of In-place Air Voids	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
8.1% to 9.0%	\$4.00	EA
9.1% to 10.0%	\$6.00	EA and Type II Surry Seal
10.1% to 11.0%	Removal*	Removal*
Greater than 11.0%	Removal	Removal

\*Notes: Removal\* refers to Section 321-10.6. The Contractor shall remove and replace the entire sublot that is deficient. Removal for In-place Air Voids greater than 11.0% is not eligible for Section 321.10.6.

## 321.10.6 Engineering Analysis (EA):

Within 10 working days after receiving notice that a sublot of asphalt concrete is deficient for "Removal" by the Engineer, the contractor may submit a written proposal (Engineering Analysis) to accept the material in place at the applicable penalties listed in the "Removal" category. Engineering Analysis can also be proposed for non-removal categories of "Corrective actions" when the contracting agency is not the owner (i.e. permits).

The Engineering Analysis shall contain an analysis of the anticipated performance of the asphalt concrete if left in place. The Engineering Analysis shall also detail the effect of any proposed corrective action on the performance. The Engineering Analysis shall be performed by a professional engineer experienced in asphalt concrete testing and mix designs. If the sublot is submitted for referee testing by the contractor, the ten working days allowed to prepare an engineering analysis will begin upon notification of referee test results.

When an Engineering Analysis recommends that a specific lot or sublot not be removed, the Engineering Analysis will recommend that the following penalties (Table 321-8) be paid when the contracting agency is the owner, for the specific criteria being reviewed by the EA.

TABLE 321-8		
ENGINEERING ANALYSIS PENALTIES for REMOVAL* LOTS/SUBLOTS LEFT IN-PLACE		
Acceptance Criteria	Acceptance Limits	Penalty When Contracting Agency is the Owner (\$/Ton)
Asphalt Binder Content	Over 0.2% points from that Permitted	\$9.00
Laboratory Air Voids (Measured at $N_{des}$ or 75 blows as applicable)	Less than 1.5% or Greater Than 8.0%	\$3.75
Limits of In-place Air Voids	10.1% to 11.0%	\$9.00

Within 15 working days, the Engineer will determine whether or not to accept the contractor's proposed Engineering Analysis.

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## SECTION 321

### 321.11 REFEREE:

In the event the contractor elects to question the acceptance test results for a subplot, the Contractor may make a written request for additional testing of that subplot. The Contractor will engage an independent laboratory (at the Contractors own expense) who is accredited by AAP, in all of the acceptance tests. The independent laboratory shall be acceptable to the Engineer and shall perform a complete new set of acceptance tests (as required by Section 321.10 representing the area or set of tests in question).

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These tests shall include asphalt binder content, aggregate gradation, Marshall or Gyratory unit weight, and maximum theoretical unit weight. Samples for referee testing shall come from representative samples obtained from the completed pavement, as directed by the Engineer.

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The number of samples taken will be the same as specified in Section 321.10. The independent laboratory shall compile the test results and transmit them to both the Engineer and the Contractor. The independent laboratory shall include a letter signed by an Engineer registered in the State of Arizona, who is experienced in asphalt concrete testing and mix designs. The signed letter shall give an opinion that the material evaluated either does or does not comply with project specifications, and shall clearly describe any deficiencies, and the results will be binding between all parties.

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### 321.12 MEASUREMENT:

Asphalt concrete pavement will be measured by the ton, or by the square yard, for the mixture actually used as allowed above, which shall include the required quantities of mineral aggregates, asphalt binder, and mineral admixture. Measurement shall include any tonnage used to construct intersections, roadways, streets, or other miscellaneous surfaces indicated on the plans or as directed by the Engineer.

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### 321.13 PAYMENT:

The asphalt concrete measured as provided above will be paid for at the contract price per ton or square yard, as adjusted per Section 321.10 ACCEPTANCE, which price shall be full compensation for the item complete, as herein described and specified.

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Payment for tack coat will be by the ton diluted, based on the rate of application, as directed by the Engineer.

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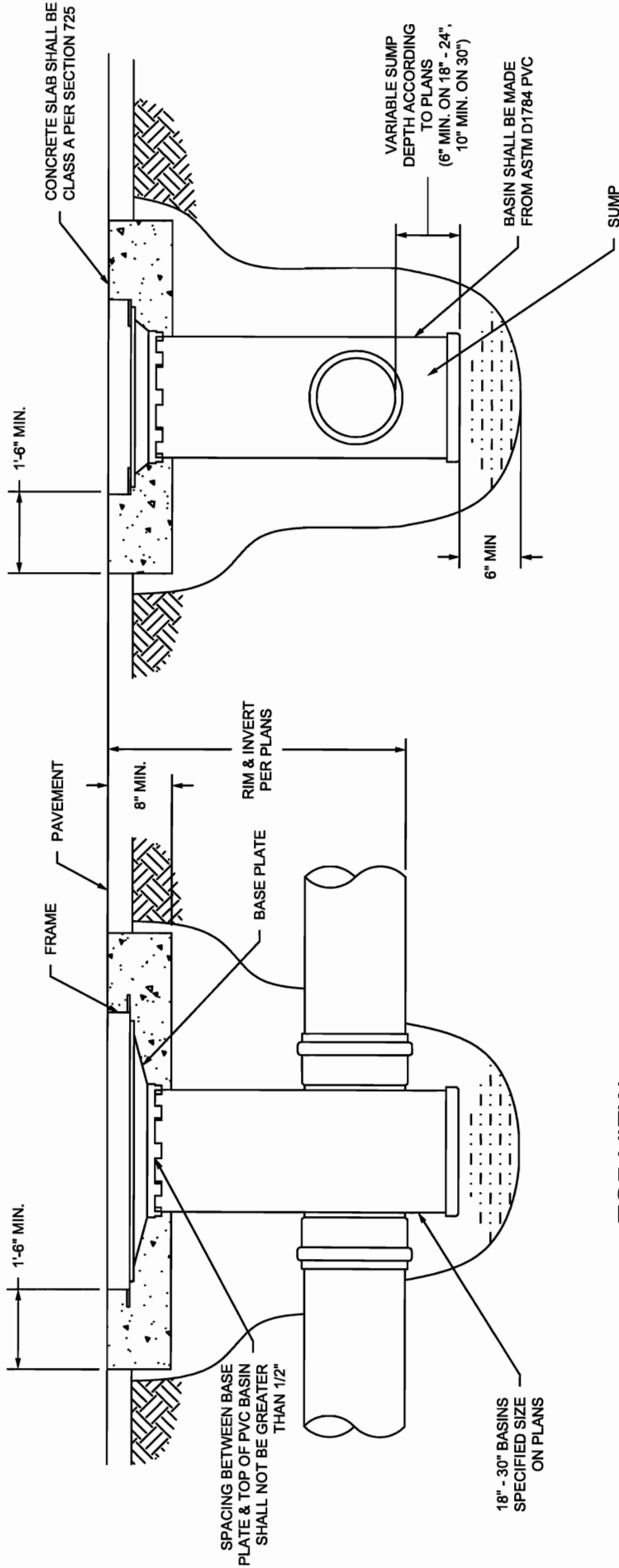
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No payment will be made for any overrun in quantity of asphalt concrete in excess of 10 percent based on actual field measurement of area covered, design thickness, and the mix design unit weight. The calculations and payment for overrun will be by individual bid item. To compensate or adjust for a thickness deficiency in an underlying asphalt concrete course, the Engineer may authorize a quantity increase in excess of 10 percent for a subsequent asphalt concrete course. In such cases, the quantity in excess of 10 percent will be paid for at the lowest unit bid price.

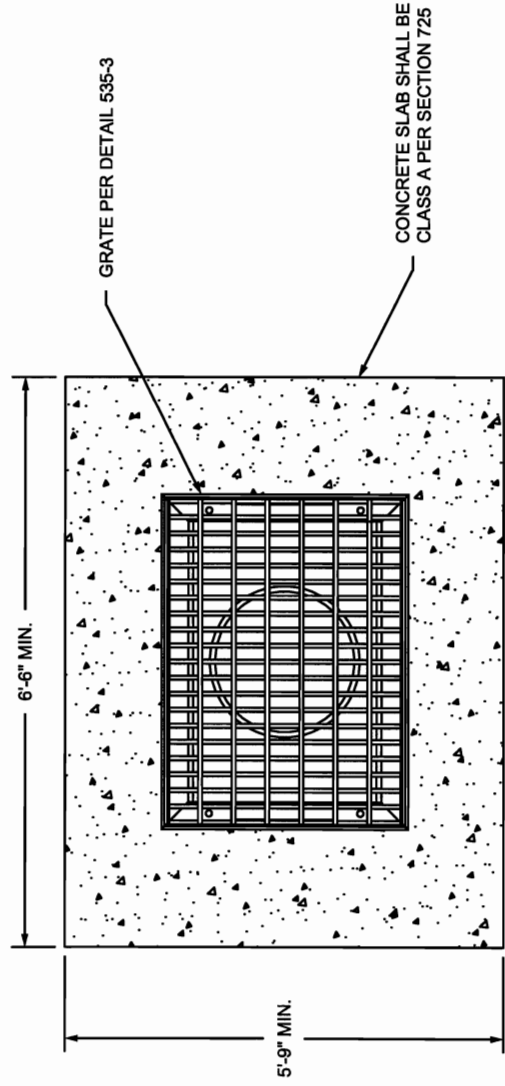
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Except as otherwise specified in the special provisions, no separate payment will be made for work necessary to construct miscellaneous items or surfaces of asphalt concrete.

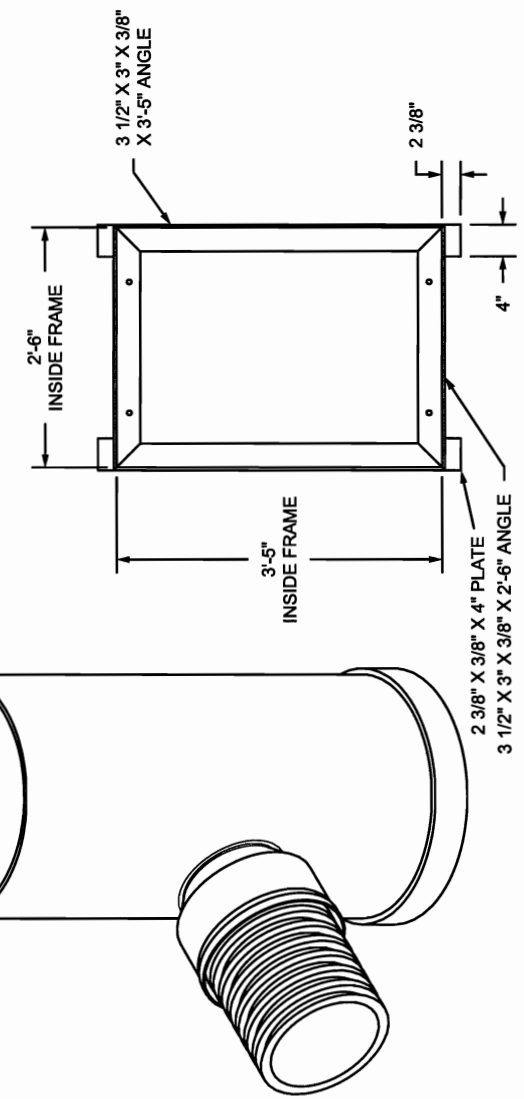
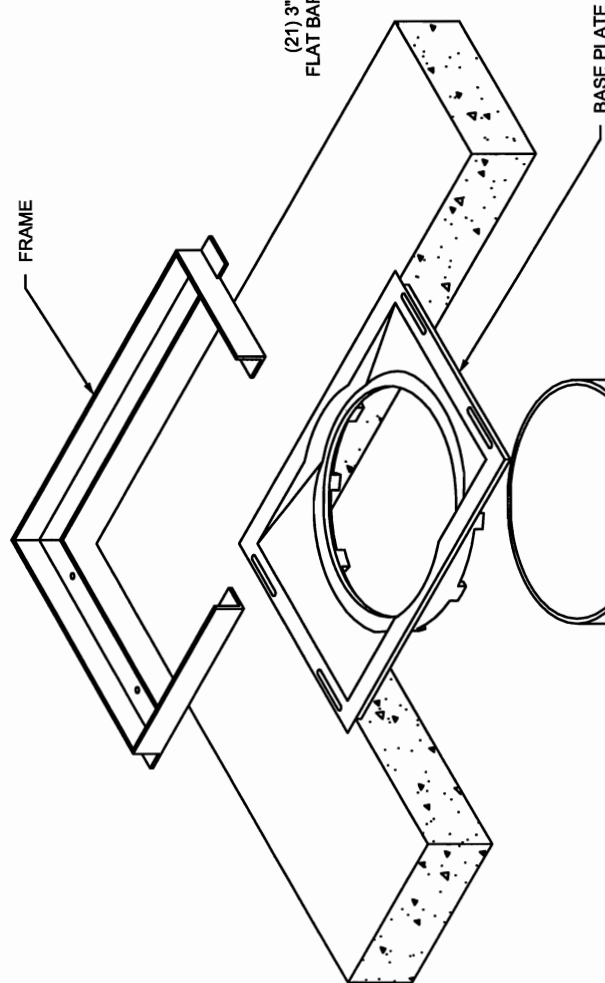
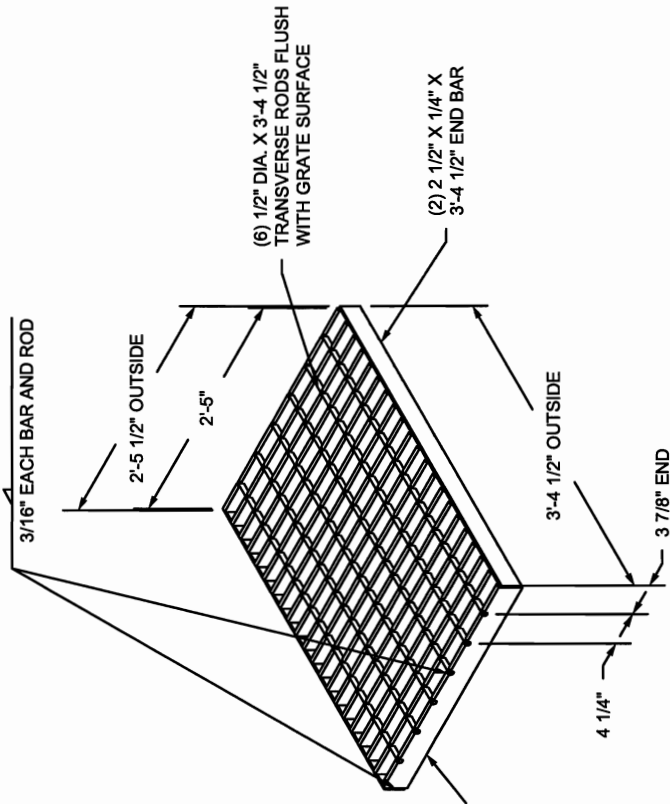




TOP VIEW

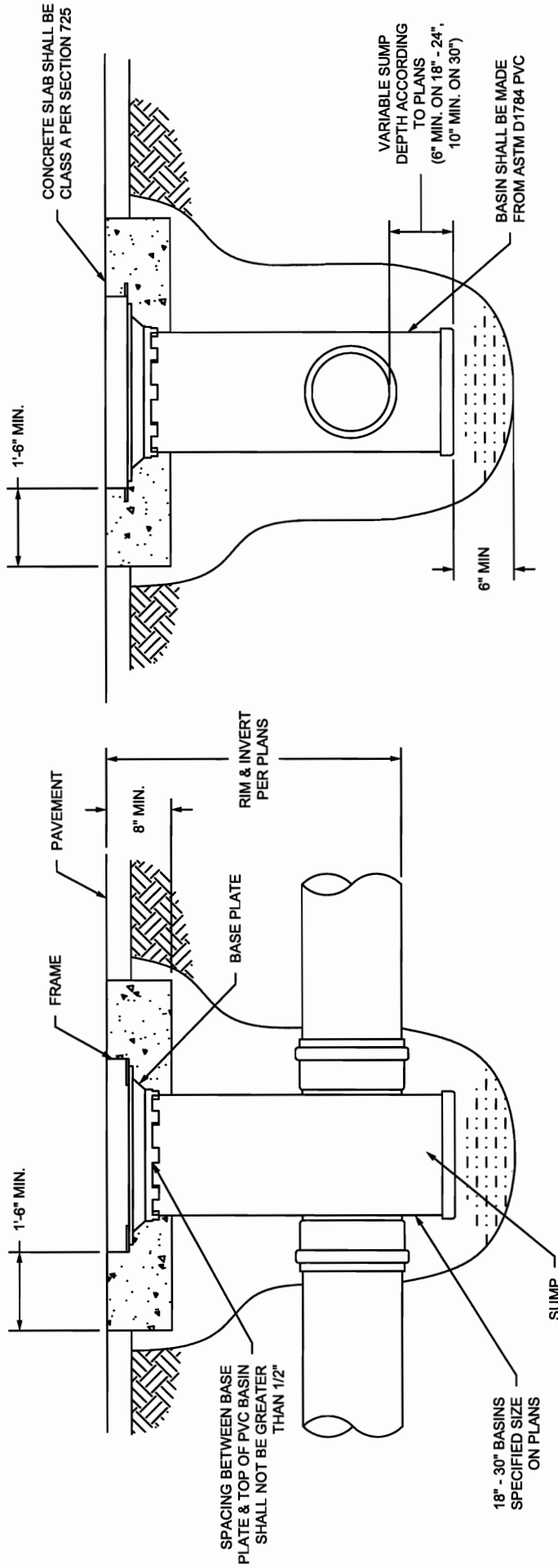


- NOTES:**
1. JOINT LOCATIONS AND STUB OUT MATERIALS SHALL BE SPECIFIED ON THE PLANS (CORRUGATED HIGH DENSITY POLYETHYLENE PIPE, PVC SDR-35, PVC SCH 40, PVC C-900, DIP). STUB OUT SHALL BE TWO FEET LONG FOR CONNECTION TO CMP AND RGRCP PIPE WITH A CONCRETE COLLAR PLACED PER MAG DETAIL 505 WITH A MAG 710.5 WATER STOP.
  2. BACKFILL MATERIAL SHALL BE CRUSHED ROCK PER SECTION 701.2.1 PLACED UNIFORMLY IN MAXIMUM 8" LIFTS & COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY PER SECTION 601.4.10 OR 1/2 SACK CLSM PER SECTION 728.
  3. FILL SUMP WITH CONCRETE TO INVERT CONCRETE SHALL BE A MINIMUM OF CLASS C PER SECTION 725.
  4. FASTEN FRAME & BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.

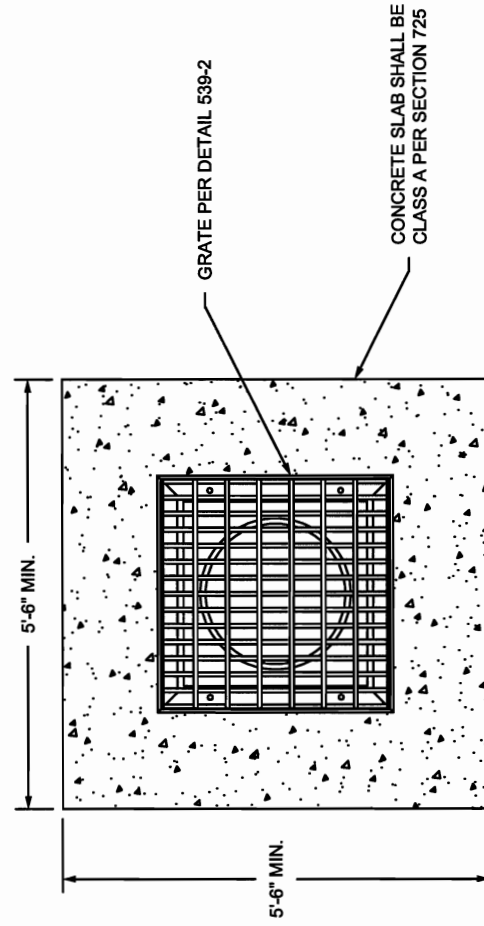


NOTES:

1. GRATE SHALL MEET H-20 LOAD RATING.
2. QUALITY: FRAME & GRATE MATERIALS SHALL CONFORM TO ASTM A-36 STEEL.
3. BASE PLATE MATERIALS SHALL CONFORM TO ASTM A53 GRADE 70-50-05 DUCTILE IRON.
4. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.
5. ALL WELDS ON FRAME AND SIDE BARS ON GRATE SHALL BE FULL LENGTH OF JOINT.
6. APPROX. DRAIN AREA = 761.18 SQ. IN.
7. TOP OF BASE PLATE TO TOP OF DRAIN BASIN: 18" & 24" BASE = 2 13/16", 30" BASE = 7/16".
8. FASTEN FRAME AND BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.



### TOP VIEW



### NOTES:

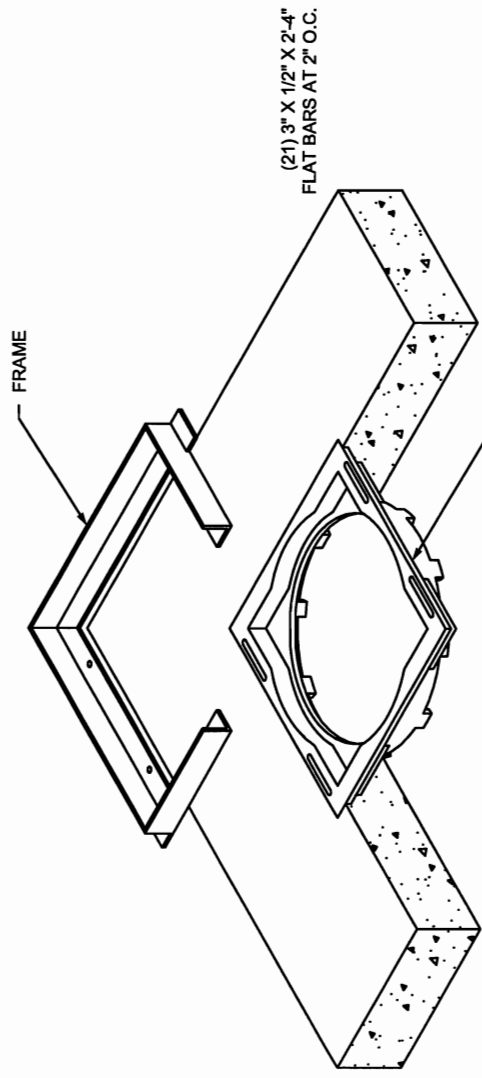
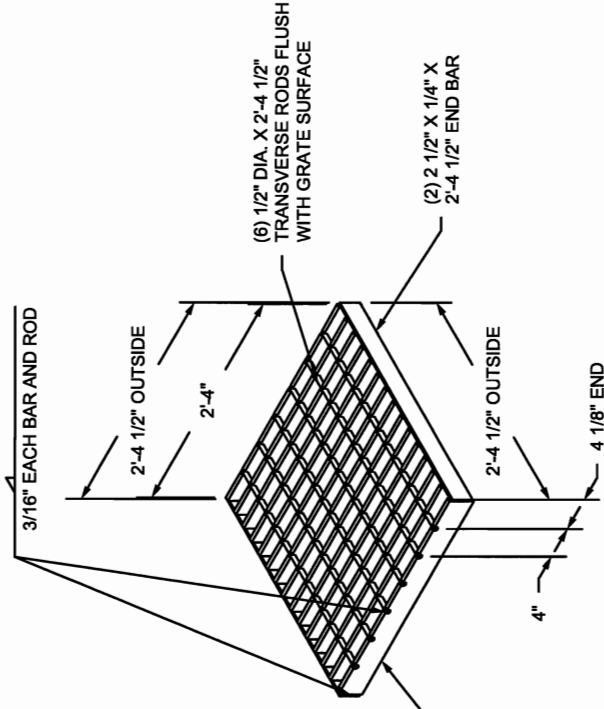
1. JOINT LOCATIONS AND STUB OUT MATERIALS SHALL BE SPECIFIED ON THE PLANS (CORRUGATED HIGH DENSITY POLYETHYLENE PIPE, PVC SDR-35, PVC SCH 40, PVC C-900, DIP). STUB OUT SHALL BE TWO FEET LONG FOR CONNECTION TO CMP AND RGRCP PIPE WITH A CONCRETE COLLAR PLACED PER MAG DETAIL 505 WITH A MAG 710.5 WATER STOP.
2. BACKFILL MATERIAL SHALL BE CRUSHED ROCK PER SECTION 701.2.1 PLACED UNIFORMLY IN MAXIMUM 8" LIFTS & COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY PER SECTION 601.4.10 OR 1/2 SACK CLSM PER SECTION 728.
3. FILL SUMP WITH CONCRETE TO INVERT CONCRETE SHALL BE A MINIMUM OF CLASS C PER SECTION 725.
4. FASTEN FRAME & BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.

DETAIL NO.  
537-2

CATCH BASIN - TYPE 'I'

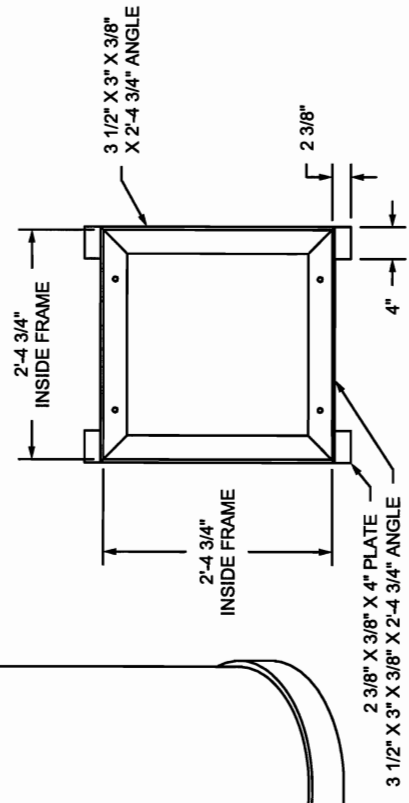
REVISED

DETAIL NO.  
537-2



**NOTES:**

1. GRATE SHALL MEET H-20 LOAD RATING.
2. QUALITY: FRAME & GRATE MATERIALS SHALL CONFORM TO ASTM A-36 STEEL.
3. BASE PLATE MATERIALS SHALL CONFORM TO ASTM A53 GRADE 70-50-05 DUCTILE IRON.
4. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.
5. ALL WELDS ON FRAME AND SIDE BARS ON GRATE SHALL BE FULL LENGTH OF JOINT.
6. APPROX. DRAIN AREA = 551.25 SQ IN.
7. TOP OF BASE PLATE TO TOP OF DRAIN BASIN: 18" & 24" BASE = 2' 13/16", 30" BASE = 7/16".
8. FASTEN FRAME AND BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.



DETAIL NO.  
539-2

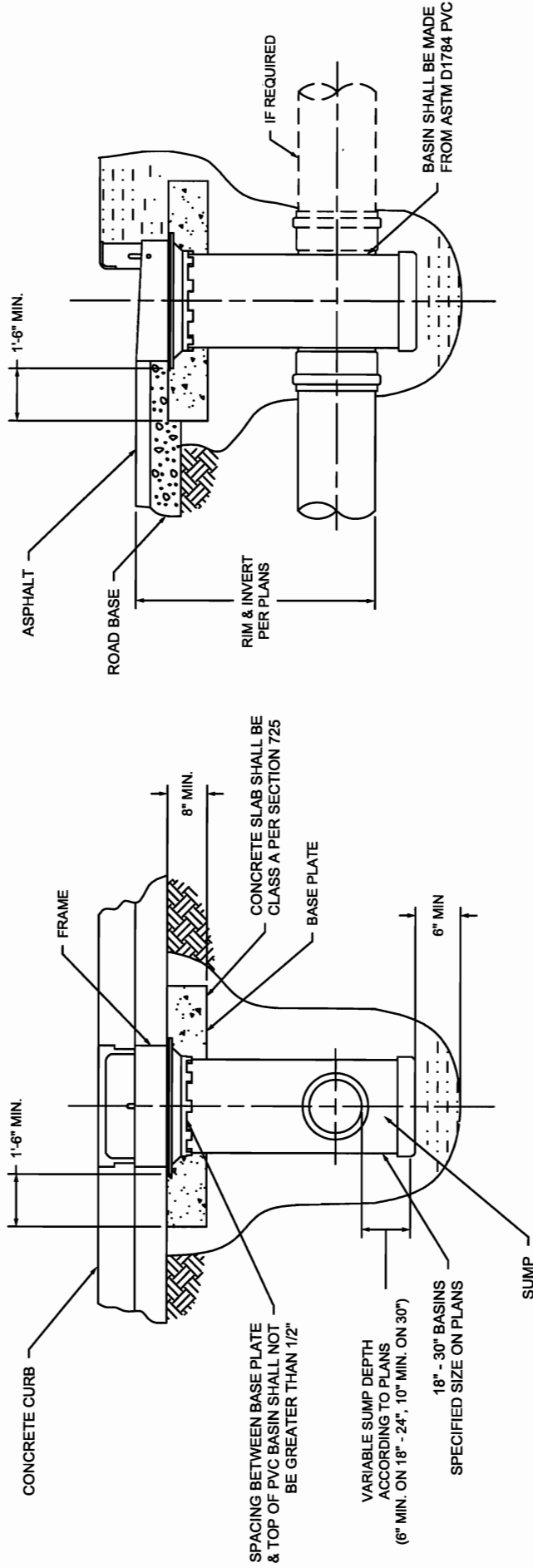
GRATE FOR CATCH BASIN '1'

REVISED

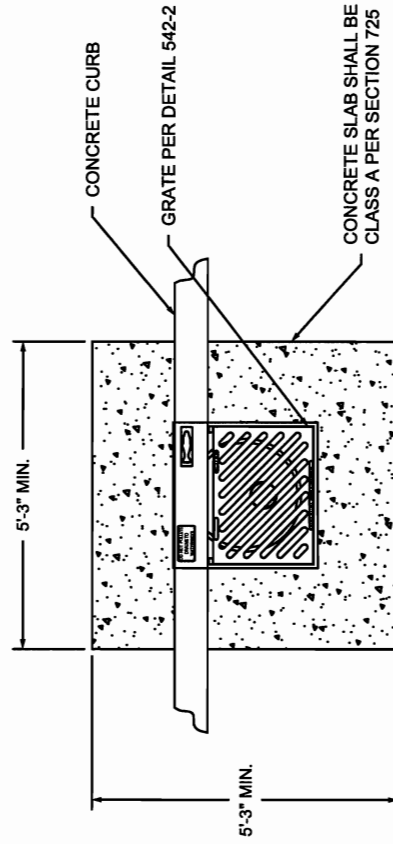
DETAIL NO.  
539-2

Include the following paragraph as new Section 601.4.10

**601.4.10 Backfill for PVC Catch Basins:** Backfill below and around PVC catch basins shall be placed in maximum 8-inch lifts and thoroughly compacted to at least 95% of maximum density when tested and determined by AASHTO T-99, Method A, with the percent of density adjusted in accordance with the rock correction procedure for maximum density determination, MAG Detail 190, to compensate for the rock content larger than that which will pass a No. 4 sieve.



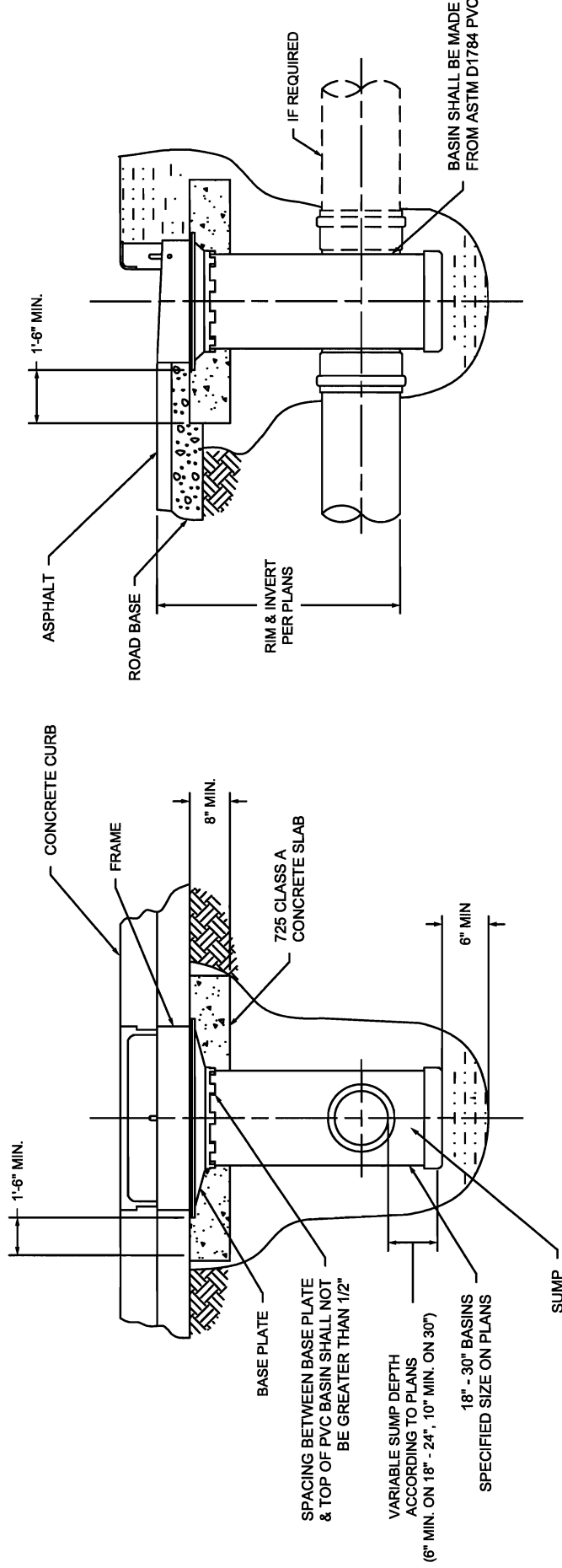
### TOP VIEW



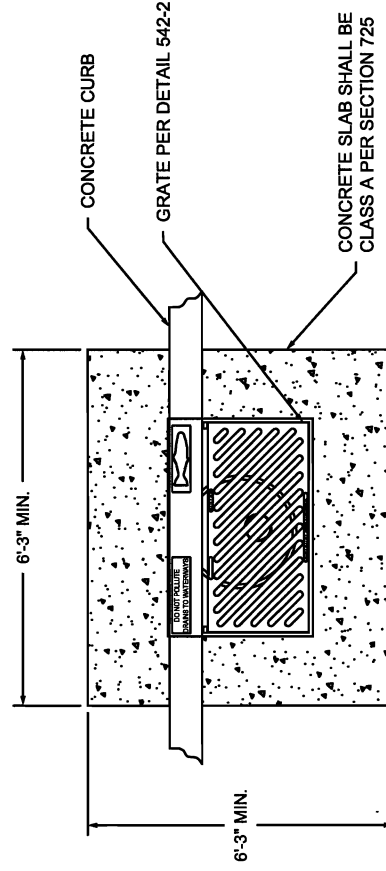
### NOTES:

1. JOINT LOCATIONS AND STUB OUT MATERIALS SHALL BE SPECIFIED ON THE PLANS (CORRUGATED HIGH DENSITY POLYETHYLENE PIPE, PVC SDR-35, PVC SCH 40, PVC C-900, DIP). STUB OUT SHALL BE TWO FEET LONG FOR CONNECTION TO CMP AND RGRCP PIPE WITH A CONCRETE COLLAR PLACED PER MAG DETAIL 505 WITH A MAG 710.5 WATER STOP.
2. BACKFILL MATERIAL SHALL BE CRUSHED ROCK PER SECTION 701.2.1 PLACED UNIFORMLY IN MAXIMUM 8" LIFTS & COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY PER SECTION 601.4.10 OR 1/2 SACK CLSM PER SECTION 728.
3. FILL SUMP WITH CONCRETE TO INVERT CONCRETE SHALL BE A MINIMUM OF CLASS C PER SECTION 725.
4. FASTEN FRAME & BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.



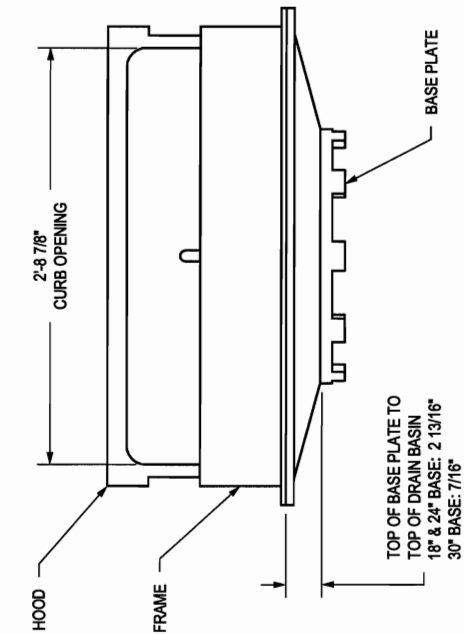
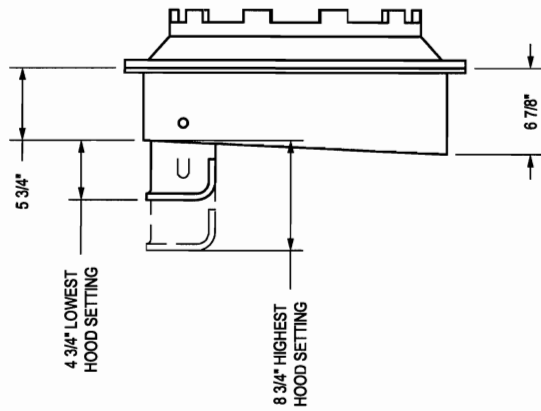
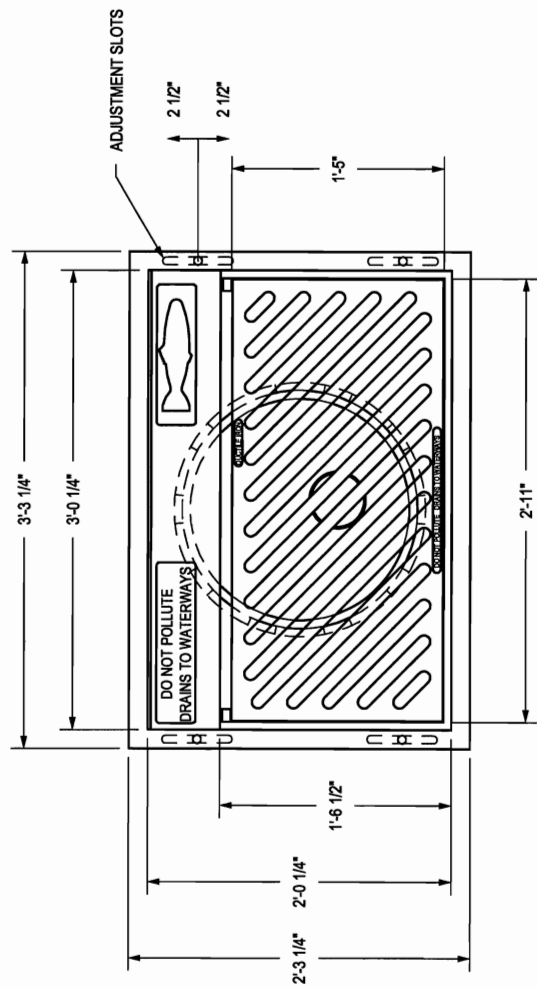


### TOP VIEW



- NOTES:
1. JOINT LOCATIONS AND STUB OUT MATERIALS SHALL BE SPECIFIED ON THE PLANS (CORRUGATED HIGH DENSITY POLYETHYLENE PIPE, PVC SDR-35, PVC SCH 40, PVC C-900, DIP). STUB OUT SHALL BE TWO FEET LONG FOR CONNECTION TO CMP AND RGRCP PIPE WITH A CONCRETE COLLAR PLACED PER MAG DETAIL 505 WITH A MAG 710.5 WATER STOP.
  2. BACKFILL MATERIAL SHALL BE CRUSHED ROCK PER SECTION 701.2.1 PLACED UNIFORMLY IN MAXIMUM 8" LIFTS & COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY PER SECTION 601.4.10 OR 1/2 SACK CLSM PER SECTION 728.
  3. FILL SUMP WITH CONCRETE TO INVERT CONCRETE SHALL BE A MINIMUM OF CLASS C PER SECTION 725.
  4. FASTEN FRAME & BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.





APPROX. DRAIN AREA OF DIAGONAL GRATE = 232.87 SQ IN.  
APPROX. DRAIN AREA OF DIAGONAL GRATE & HOOD

LOWEST SETTING = 369.54 SQ IN  
LOWEST + 1" SETTING = 402.41 SQ IN  
LOWEST + 2" SETTING = 435.29 SQ IN  
LOWEST + 3" SETTING = 468.16 SQ IN  
HIGHEST SETTING = 501.044 SQ IN

HIGHEST SETTING = 501.044 SQ IN.  
APPROX. WEIGHT OF GRATE = 112.5 LBS.  
APPROX. WEIGHT OF GRATE, FRAME & HOOD ASSEMBLY  
W/ 18" BASE = 477.5 LBS.  
W/ 24" BASE = 466.0 LBS.,  
W/ 30" BASE = 436.5 LBS.

(16) 1" GRATE SLOTS

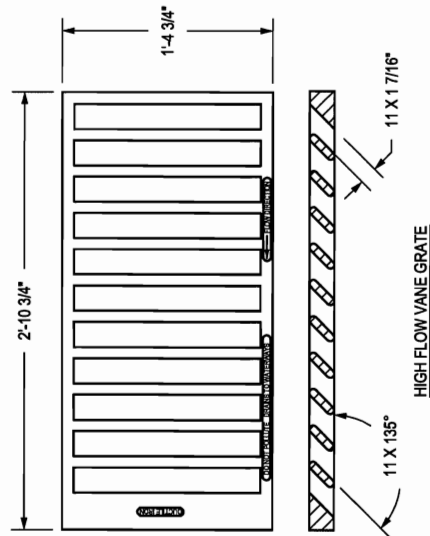
APPROX. DRAIN AREA OF DIAGONAL GRATE = 327.25 SQ. IN.  
APPROX. DRAIN AREA OF DIAGONAL GRATE & HOOD

LOWEST SETTING = 463.92 SQ IN  
LOWEST + 1" SETTING = 496.79 SQ IN  
LOWEST + 2" SETTING = 529.67 SQ IN  
LOWEST + 3" SETTING = 562.54 SQ IN  
HIGHEST SETTING = 595.42 SQ IN  
X. WEIGHT OF GRATE = 123.0 LBS.

APPROX. WEIGHT OF GRATE = 1200 LBS.  
W/ 18" BASE = 488.0 LBS.  
W/ 24" BASE = 476.5 LBS.,  
W/ 30" BASE = 447.0 LBS.

**NOTES:**

- NOTES:
1. MATERIAL: DUCTILE IRON GRATE SHALL MEET H-20 LOAD.
  2. RATING & CONFORMING TO ASTM A536 GRADE 70-50.
  3. ALL CASTINGS ARE FURNISHED WITH BLACK PAINT.
  4. SLOPE OF GRATE SURFACE IS 5.2%.
  5. CURB INLET FRAME INSIDE VOLUME IS APPROX. 2.73 CU FT.
  6. FASTEN FRAME & BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.

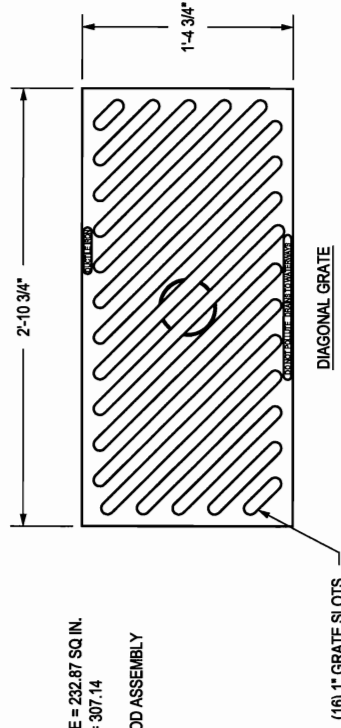
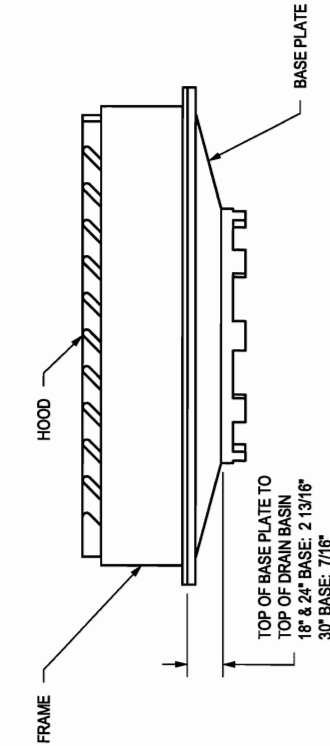
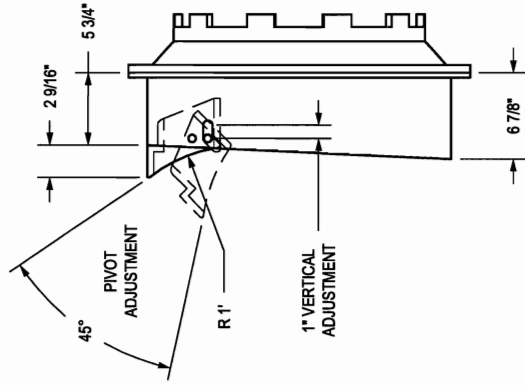
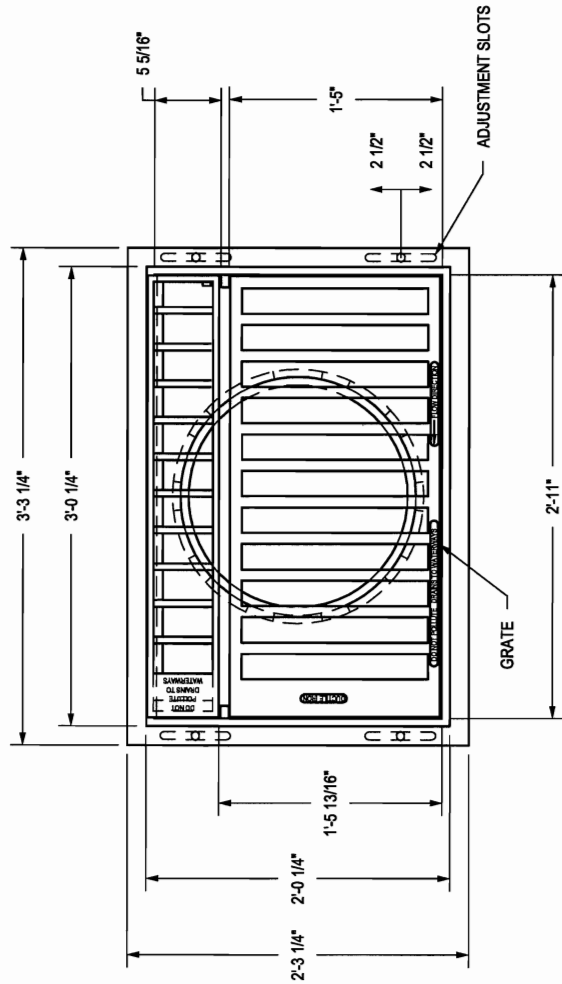


**DETAIL NO.**  
**543-2**

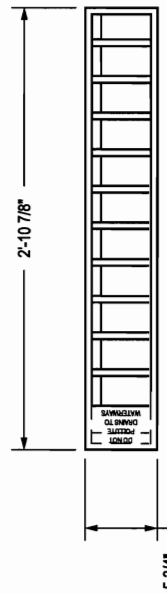
2' X 3' CURB INLET DETAIL TYPE "A"

REVISÉ

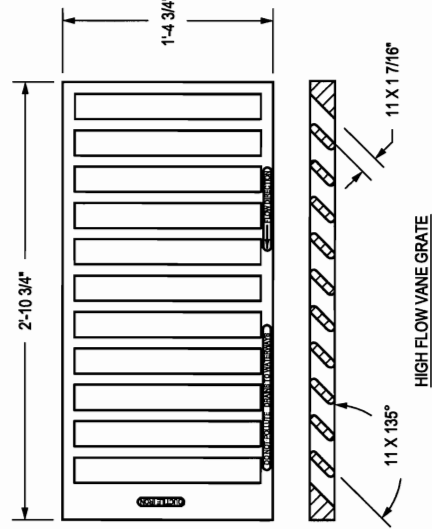
DETAIL NO.  
543-2



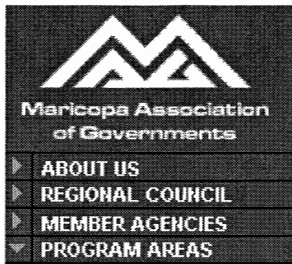
APPROX. DRAIN AREA OF DIAGONAL GRATE = 232.87 SQ IN.  
 APPROX. WEIGHT OF GRATE & HOOD = 307.14  
 APPROX. WEIGHT OF GRATE = 112.5 LBS.  
 W/ 18" BASE = 458.0 LBS.  
 W/ 24" BASE = 448.5 LBS..  
 W/ 30" BASE = 417 LBS.



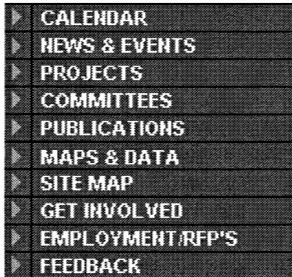
APPROX. DRAIN AREA OF GRATE = 327.25 SQ IN.  
 APPROX. DRAIN AREA OF GRATE & HOOD = 401.52 SQ IN.  
 APPROX. WEIGHT OF GRATE = 123.0 LBS.  
 APPROX. WEIGHT OF GRATE, FRAME & HOOD ASSEMBLY  
 W/ 18" BASE = 488.5 LBS.  
 W/ 24" BASE = 457.0 LBS..  
 W/ 30" BASE = 427.5 LBS.



- NOTES:
1. MATERIAL: DUCTILE IRON GRATE SHALL MEET H-20 LOAD.
  2. RATING & CONFORMING TO ASTM A536 GRADE 70-50-05.
  3. ALL CASTINGS ARE FURNISHED WITH BLACK PAINT.
  4. SLOPE OF GRATE SURFACE IS 5.2%.
  5. CURB INLET FRAME INSIDE VOLUME IS APPROX. 2.73 CU FT.
  6. FASTEN FRAME & BASE PLATE WITH (4) 5/8" ZINC PLATED BOLTS.



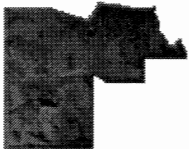
Transportation  
Human Services  
Information Services  
Environmental Programs  
Communications  
Administration



302 North 1st Avenue  
Suite 300  
Phoenix, Arizona 85003

Phone (602) 254-6300  
FAX (602) 254-6490

Spanish language  
assistance available at (602)  
452-5080



## RESOURCE

### Case 08-03: Comments from AGC on Asphalt Rubber

The AGC/ARPA technical committee have been trying to get together to recommend changes to the MCDOT's rubber spec.

We recommend adopting the following: (For a discussion item)

ADOT's gradation, however, may need some tweaking, or make allowances to have 100% passing the 1/2" sieve for 1"-1.5" overlays.

Too many people were involved developing the MCDOT 325 and 717 specifications that had little, no experience in these types of designs. The binder range for high and low traffic should be a clue. MCDOT's 717 binder design is very similar to ADOT 1009, with a 5cm minimum ductility thrown in. The ductility test, is useless and can create problems with particle interference during the test to cause a premature failure. Push for use of the ADOT Spec. Same gradation as most, with a modern Design and Asphalt Rubber Method.

1. Push COP Method, more complete then MCDOT's spec, and does not use a coarse gradation.
2. Strongly point out the lack of a decent Rubber binder spec and Design spec in MCDOT's proposal.

We have a sub committee working on the binder part of this. We will not have anything on it for a couple of weeks.

The table (download below) shows most rubber specs.

Thanks,

**Jeff Benedict**  
Corporate Business Development  
Sunland Asphalt

[Download \(11 K\)\(application/pdf\)](#)

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# ARPA / AGC

## MAG / ADOT Asphalt Rubber - Asphalt Concrete    Review - April 2008

### Gradation Specifications

Sieve % Passing	MCDOT 1" -1.5"	MCDOT 2"	COP Major Streets	COP Residential	Mesa Wet	Mesa T Blend	Glendale	ADOT	
1"	100	100	100	100	100	100	100	100	
3/4"	100	97-100	100	100	100	100	100	100	
1/2"	100	78-92	100	100	100	100	100	80-100	
3/8"	78-92	61-75	82-88	82-88	78-92	82-88	78-92	65-80	
#4	28-42	30-40	32-38	32-38	28-42	32-38	28-42	29-43	
#8	15-25	15-25	13-19	13-19	15-25	13-19	15-25	15-23	
#30	5-15	5-15	6-10	6-10	5-15	6-10	5-15	--	
#40	--	--	--	--	--	--	--	--	
#200	3-7	2-6	2-6	2-6	3-7	2-6	3-7	0-3.5	

### ARAC Mix Specifications

	MCDOT 1" -1.5"	MCDOT 2"	COP Major Streets	COP Residential	Mesa Wet	Mesa T Blend	Glendale	ADOT	
ARB %	8.0-8.4*	7.1-7.4	7.6-8.2	8.1-8.7	7.5+	6.5-7.0	7.0-9.0 ***	****	
Mix Air Voids %	4.0-6.0	4.0-6.0	4.0-6.0	2.5-4.5	3.0-5.0	3.5-4.5	4.0-6.0	5.0-6.0	
VMA %	--	--	Min 19	Min 19	15.5 - 24	15.5 - 24	15.5 - 24	Min 19	
Stab, (lbs)	--	--	Min 800	Min 800	Min 600	Min 800	Min 600	--	
SE %	Min 65	Min 65	Min 65	Min 65	Min 50	Min 65	Min 65	Min 55	
Cr. Faces %	Min 85	Min 85	Min 85	Min 85	Min 85	Min 85	Min 95	Min 92	
ARB Method	MAG 717	MAG 717	COP & 717	COP & 717	Mesa/ADOT	Mesa/ADOT	MAG 717	ADOT 1009	
Design Method	Chehovits	Chehovits	T-245	T-245	Mesa/MAG	Mesa/MAG	MAG	ARIZ 832	
Mineral Admix	1.0/1.5**	1.0/1.5**	Min 1.5%	Min 1.5%	MAG	MAG	MAG	1.0%	

\* 8.0-8.4 is for High Traffic, 8.4-8.8% is specified for Low Traffic

\*\* 1.0% = Lime, 1.5% = Cement

\*\*\* 7.0-8.0% is High traffic, 8.0-9.0 is for Low Traffic

\*\*\*\* ARB % determine by Mix Air Void content

### Notes

- A. Each agency is using the same or very similar gradation specification, except MCDOT 2" Lift
- B. Asphalt Binder % and Air Void ranges vary within a narrow range
- C. In general, expect for ADOT, Mix design methods refer to Marshall 75 blow test methods, and MAG specifications
- D. In general, expect for ADOT and COP, ARB design methods refer to MAG 717 and are outdated when compared to ADOT methods
- E. Only MCDOT uses a gradation with 1/2" & 3/4" coarse aggregates
- F. Only Mesa includes a "Terminal Blend Rubber" vs. "Wet Process Rubber" specification
- G. Only ADOT and COP use VMA specifications that match the Gap-Graded gradation and high film thickness of ARAC
- H. Mix compaction temps are 290-295 F for each agency, except ADOT which is 325 F

## Gordon Tyus

---

**From:** Steve Borst [sborst@buckeyeaz.gov]  
**Sent:** Wednesday, April 02, 2008 10:16 AM  
**To:** Gordon Tyus  
**Cc:** Damon DeQuenne; Manuel Alvarez  
**Subject:** MAG Details for Backflow Protection  
**Attachments:** Scanned document from Scan PW

Gordon,

For consideration of Case 08-04 I am attaching an excerpt of Arizona Administrative Code and copies of pages from the Manual of Cross Connection Control.

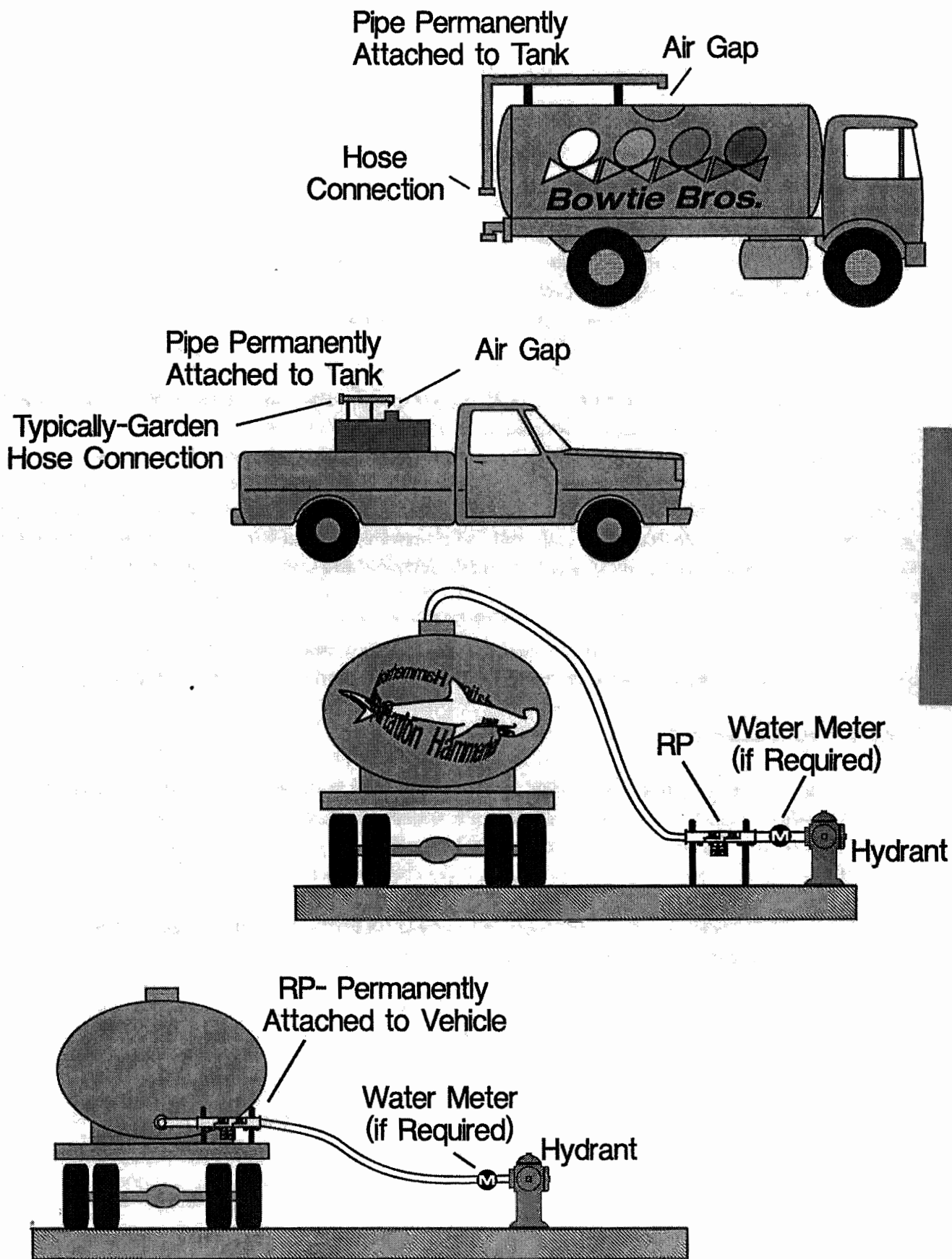
This material I would like handed out for discussion at the MAG committee meeting today, as was requested of me at the last meeting.

I intend to propose that this case be re-submitted with the intent to remove any existing specification or details for backflow protection. This is an operational and not a construction practice that is regulated by the Federal government, administered by State and Local governments and implemented by water utility systems/companies under separate and distinct approved backflow programs. When a construction entity wishes to tie into an existing water system, it should be incumbent upon the operating utility to specify the manner of protection for the system when the utility issues the water meter for this type of use.

These type of details do not fit within the jurisdictional scope for which the MAG Standards and Details are intended for construction within municipal ROW's and appear to result in numerous supplements.

*Steven G. Borst, P.E.*

Town of Buckeye,  
Engineering Manager  
423 Arizona Eastern Ave.  
Buckeye, Arizona 85326  
(623) 349-6803  
(623) 344-6209 fax



**Fig. 7.21**  
*Proper Methods of Filling Portable Spray and Cleaning Equipment*

**R18-4-115. Backflow Prevention**

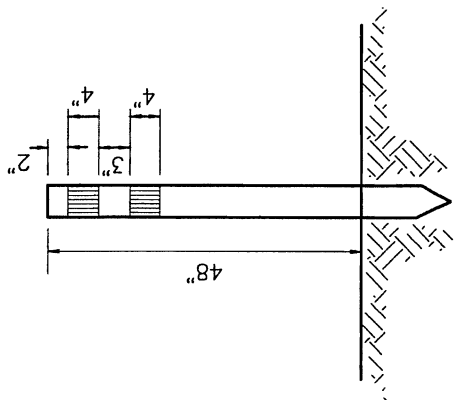
- A. A public water system shall protect its system from contamination caused by backflow through unprotected cross-connections by requiring the installation and periodic testing of backflow-prevention assemblies. Required backflow-prevention assemblies shall be installed as close as practicable to the service connection.
- B. A public water system shall ensure that a backflow-prevention assembly is installed whenever any of the following occur:
  - 1. A substance harmful to human health is handled in a manner that could permit its entry into the public water system. These substances include chemicals, chemical or biological process waters, water from public water supplies that has deteriorated in sanitary quality, and water that has entered a fire sprinkler system. A Class 1 or Class 2 fire sprinkler system is exempt from the requirements of this Section;
  - 2. A source of water supply exists on the user's premises that is not accepted as an additional source by the public water system or is not approved by the Department;
  - 3. An unprotected cross-connection exists or a cross-connection problem has previously occurred within a user's premises; or
  - 4. There is a significant possibility that a cross-connection problem will occur and entry to the premises is restricted to the extent that cross-connection inspections cannot be made with sufficient frequency or on sufficiently short notice to assure that unprotected cross-connections do not exist.
- C. Unless a cross-connection problem is specifically identified, or as otherwise provided in this Section, the requirements of this Section shall not apply to single family residences used solely for residential purposes.
- D. A backflow-prevention assembly required by this Section shall comply with the following:
  - 1. If equipped with test cocks, it shall have been issued a certificate of approval by:
    - a. The University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC-FCCCCHR), or
    - b. A third-party certifying entity that is unrelated to the product's manufacturer or vendor, and is approved by the Department.
  - 2. If not equipped with test cocks, it shall be approved by a third-party certifying entity that is unrelated to the product's manufacturer or vendor and is approved by the Department.
- E. The minimum level of backflow protection that is provided to protect a public water system shall be the level recommended in Section 7.2 of the Manual of Cross-Connection Control, Ninth Edition, USC-FCCCCHR, KAP-200 University Park MC-2531, Los Angeles, California, 90089-2531, December 1993, (and no future editions or amendments), incorporated by reference and on file with the Department and the Office of the Secretary of State. The types of backflow prevention that may be required, listed in decreasing order according to the level of protection they provide, include: an air-gap separation (AG), a reduced pressure principle backflow prevention (RP) assembly, a pressure vacuum breaker (PVB) assembly, and a double check valve (DC) assembly. Nothing contained in this Section shall prevent the public water system from requiring the use of a higher level of protection than that required by this subsection.
  - 1. A public water system may make installation of a required backflow-prevention assembly a condition of service. A user's failure to comply with this requirement shall be sufficient cause for the public water system to terminate water service.
  - 2. Specific installation requirements for backflow prevention include the following:
    - a. Any backflow prevention required by this Section shall be installed in accordance with the manufacturer's specifications.
    - b. For an AG installation, all piping between the user's connection and the receiving tank shall be entirely visible unless otherwise approved in writing by the public water system.
    - c. An RP assembly shall not be installed in a meter box, pit, or vault unless adequate drainage is provided.
    - d. A PVB assembly may be installed for use on a landscape water irrigation system if the irrigation system conforms to all of the criteria listed below. An RP assembly is required whenever any of the criteria are not met.
      - i. The water use beyond the assembly is for irrigation purposes only;
      - ii. The PVB is installed in accordance with the manufacturer's specifications;
      - iii. The irrigation system is designed and constructed to be incapable of inducing backpressure; and
      - iv. Chemigation, the injection of chemical pesticides and fertilizers, is not used or provided in the irrigation system.
- F. Each backflow-prevention assembly required by this Section shall be tested at least annually, or more frequently if directed by the public water system or the Department. Each assembly shall also be tested after installation, relocation, or repair. An assembly shall not be placed in service unless it has been tested and is functioning as designed. The following provisions shall apply to the testing of backflow-prevention assemblies:
  - 1. Testing shall be in accordance with procedures described in Section 9 of the Manual of Cross-Connection Control. The public water system shall notify the water user when testing of backflow-prevention assemblies is needed. The notice shall specify the date by which the testing must be completed and the results forwarded to the public water system.

2. Testing shall be performed by a person who is currently certified as a "general" tester by the California-Nevada Section of the American Water Works Association (CA-NV Section, AWWA), the Arizona State Environmental Technical Training (ASETT) Center, or other certifying authority approved by the Department.
  3. When a backflow-prevention assembly is tested and found to be defective, it shall be repaired or replaced in accordance with the provisions of this Section.
- G. A public water system shall maintain records of backflow-prevention assembly installations and tests performed on backflow-prevention assemblies in its service area. Records shall be retained by the public water system for at least three years and shall be made available for review by the Department upon request. These records shall include an inventory of backflow-prevention assemblies required by this Section and, for each assembly, all of the following information:
1. Assembly identification number and description,
  2. Location,
  3. Date of tests,
  4. Description of repairs and recommendations for repairs made by the tester, and
  5. The tester's name and certificate number.
- H. A public water system shall submit a written cross-connection incident report to the Department and the local health authority within five business days after a cross-connection problem occurs that results in contamination of the public water system. The report shall address all of the following:
1. Date and time of discovery of the unprotected cross-connection,
  2. Nature of the cross-connection problem,
  3. Affected area,
  4. Cause of the cross-connection problem,
  5. Public health impact,
  6. Date and text of any public health advisory issued,
  7. Each corrective action taken, and
  8. Date of completion of each corrective action.
- I. An individual with direct responsibility for implementing a backflow prevention program for a water system serving more than 50,000 persons, or if the Department has determined that such a need exists, shall be licensed as a "cross-connection control program specialist" by the CA-NV Section, AWWA, the ASETT Center, or other certifying authority approved by the Department.

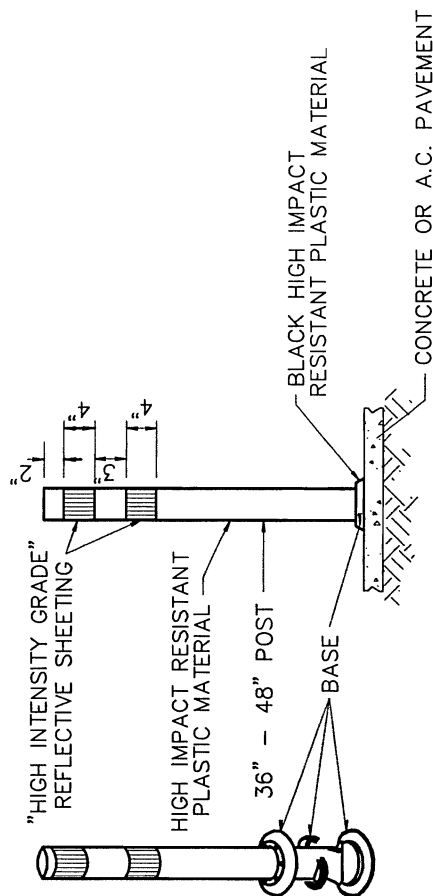
#### **Historical Note**

Former Section R9-20-520 repealed, new Section R9-20-520 adopted effective November 1, 1979 (Supp. 79-6).  
Former Section R9-20-520 amended, renumbered as Section R9-20-515, then renumbered as Section R18-4-115 effective October 23, 1987 (Supp. 87-4). R18-4-115 recodified to R18-5-115 (Supp. 95-2). New Section adopted effective April 28, 1995 (Supp. 95-2). Amended by final rulemaking at 8 A.A.R. 973, effective February 19, 2002 (Supp. 02-1).

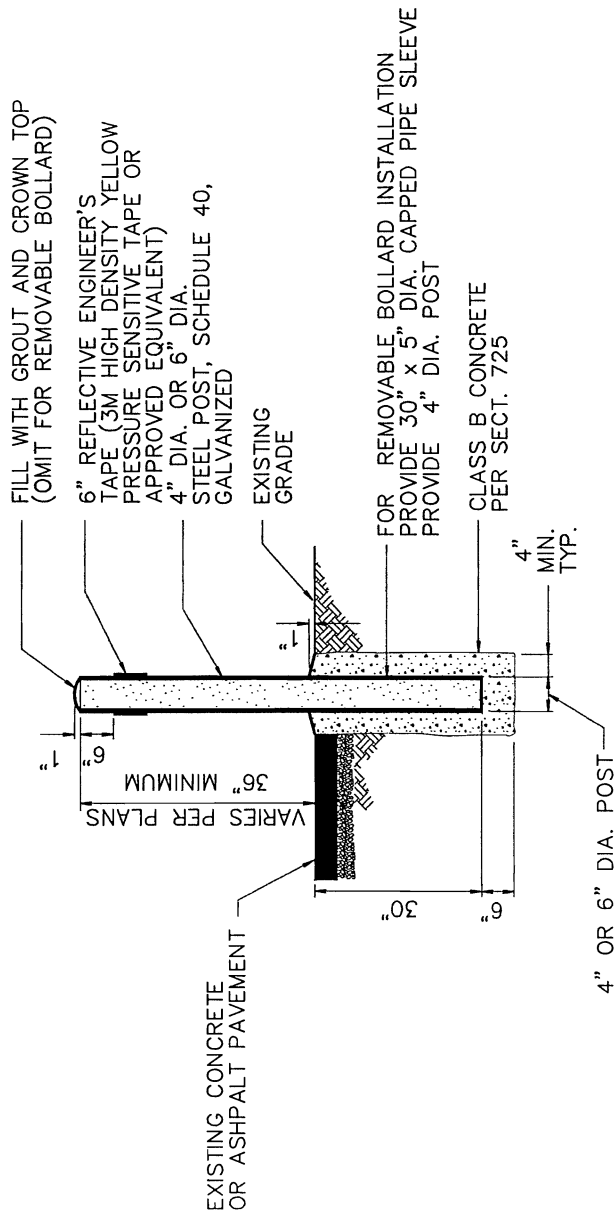




GROUND MOUNT HAZARD MARKER



SURFACE MOUNT HAZARD MARKER

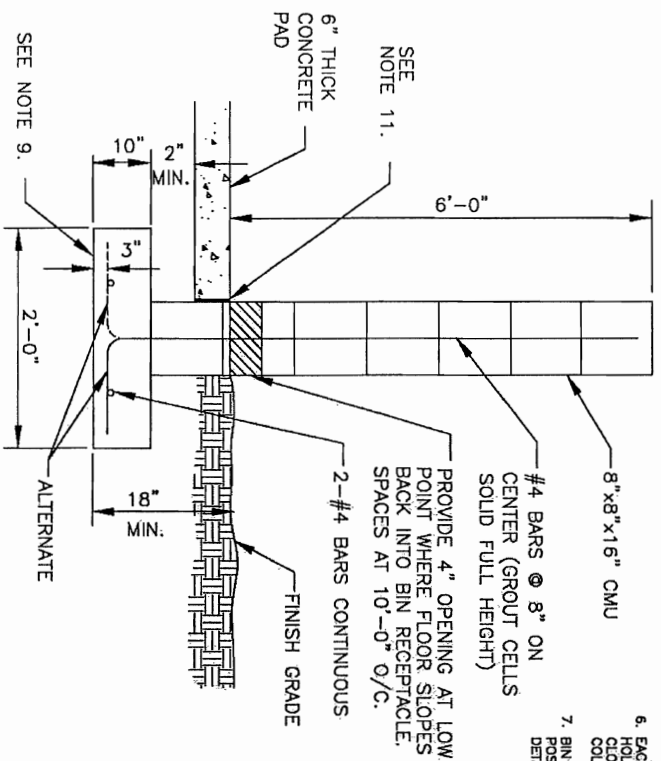


SAFETY POST SECTION

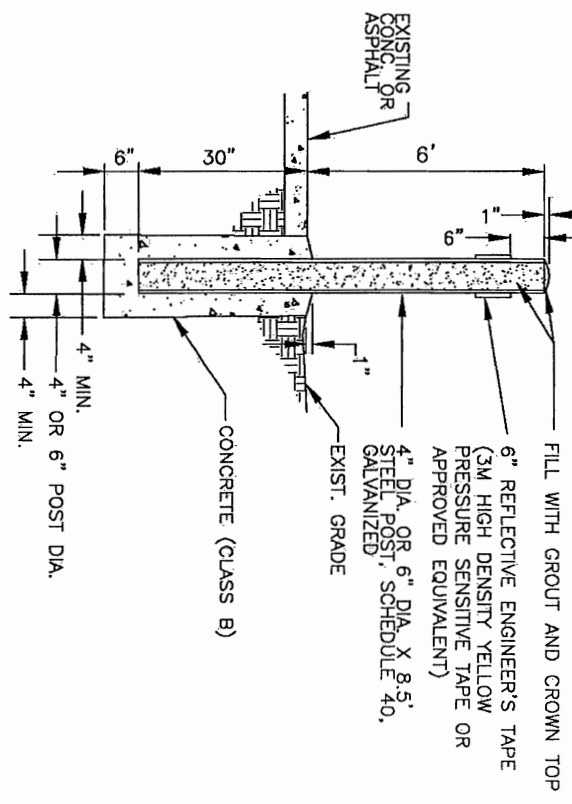
HAZARD MARKER NOTES

1. CONTRACTOR SHALL CLEAN ROADWAY SURFACE PRIOR TO PLACEMENT OF FLEXIBLE TUBULAR MARKER.
2. FLEXIBLE TUBULAR MARKERS SHALL BE INSTALLED WITH AN ADHESIVE AS PER TUBULAR MARKER MANUFACTURER'S SPECIFICATIONS.
3. YELLOW TUBULAR MARKERS SHALL HAVE A YELLOW POST AND YELLOW "HIGH INTENSITY GRADE" REFLECTIVE SHEETING. ORANGE TUBULAR MARKERS SHALL HAVE AN ORANGE POST AND WHITE HIGH INTENSITY REFLECTIVE SHEETING.
4. POST SHALL BE FLEXIBLE, HIGH IMPACT RESISTANT PLASTIC MATERIAL.
5. BASE SHALL BE CEMENTED TO SURFACE WITH EPOXY MATERIAL AS RECOMMENDED BY THE MANUFACTURER.

# 6-FOOT MASONRY SCREEN WALL N.T.S.



# SAFETY POST N.T.S.



1. TRASH AND RECYCLING BIN AREA SHALL BE SCREENED WITH A SIX FOOT (6') MASONRY WALL PER DETAIL ON THIS SHEET.
2. BIN ENCLOSURE TO BE A MINIMUM OF 3 FEET FROM ANY PLANNED OR EXISTING STRUCTURE AT ITS CLOSEST POINT.
3. BINS THAT ARE VISIBLE FROM A PUBLIC ROADWAY SHALL HAVE ENCLOSURE GATES THAT SCREEN THE BINS FROM PUBLIC VIEW.
4. GATES SHALL BE INSTALLED SO THERE IS A NET BIN ENCLOSURE OPENING OF 12 FEET PER BIN, GATES, HINGES, AND MOUNTING HARDWARE SHALL NOT INTRUDE UPON MINIMUM NET ENCLOSURE OPENING.
5. GATES, HINGES, AND MOUNTING HARDWARE SHALL BE INSTALLED SO THERE IS A MINIMUM 9 FOOT DEPTH CREATED WITHIN EACH ENCLOSURE.
6. EACH ENCLOSURE GATE SHALL HAVE DROP PINS INSTALLED AND HOLES DRILLED IN THE CONCRETE AT BOTH THE OPEN AND CLOSED POSITIONS TO PREVENT GATES FROM CLOSING INTO THE COLLECTION VEHICLE.
7. BIN ENCLOSURES SHALL HAVE (2) 4" DIAMETER STEEL SAFETY POSTS INSTALLED IN THE BACK OF THE ENCLOSURE ONLY PER DETAIL ON THIS SHEET.
8. SAFETY POSTS SHALL HAVE A HEIGHT OF 6 FEET OR BE EQUAL TO THE HEIGHT OF THE BACK SCREEN WALL OF THE ENCLOSURE. SAFETY POSTS SHALL BE PLACED A MINIMUM OF 4' FROM THE WALL.
9. USE CLASS "A" CONCRETE AS PER SECTION 725 EXCEPT AS NOTED IN SAFETY POST DETAIL ON THIS SHEET.
10. STEEL REINFORCEMENT SHALL BE GRADE 40.
11. EXPANSION JOINT FILLER SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER ASTM D-1751.
12. EXTERIOR FINISH OF 6 FOOT MASONRY SCREEN WALLS SHALL BE COORDINATED ARCHITECTURALLY WITH PRIMARY BUILDING FINISHES.
13. SOIL BELOW THE WALL FOOTER AND CONCRETE PAD SHALL BE COMPACTED TO A DEPTH OF 6 INCHES AND TO A MINIMUM DRY DENSITY OF 90% IN ACCORDANCE WITH ASTM D-2922 AND D-3017, AFTER ADJUSTMENT FOR ROCK CORRECTION.
14. STANDARDS FOR SOLID WASTE VEHICLE ACCESS ARE ADDRESSED IN M-62.1.
15. STANDARDS FOR SINGLE, DOUBLE, AND TRIPLE-WIDE BIN ENCLOSURES ARE ADDRESSED IN M-62.2 AND M-62.3.

Revised Case 08-07  
Date 4-2-08  
G. Haws, City of Mesa

## SECTION 109

### MEASUREMENTS AND PAYMENTS

→ Changes only to pages 2 & 3.

#### 109.1 MEASUREMENT OF QUANTITIES:

All work completed under the contract will be measured by the Engineer according to United States standard measures. The methods of measurement and computation to be used in determination of quantities of materials furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice. A station, when used as a definition or term of measurement, will be 100 linear feet.

Unless otherwise specified, longitudinal measurements will be made along the grade line.

Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

The term ton will mean the short ton consisting of 2,000 pounds avoirdupois.

Unless otherwise specified, structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

In computing volumes of excavations or fill, the average end area method or other acceptable methods as determined by the Engineer will be used.

Volumes will be computed at 60°F, using ASTM D-1250 for Asphalt or ASTM D-633 for Tars.

Lumber will be measured by the thousand board foot measure actually used in the work. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term lump sum, when used as a pay item, will mean complete payment for the work described.

Sundry items which have a basis for measurement and payment herein and which are incidental to or required in the construction of the work but are not included as items in the bid schedule shall be considered an integral part of the contract, and all labor, materials, etc. required for such items shall be furnished by the Contractor and the cost of same included in the unit price bid.

#### 109.2 SCOPE OF PAYMENT:

Measurement and payment for pay items in the proposal will be as indicated in the applicable standard specification or in the special provisions.

When payment is specified to be made on the basis of weight, the weighing shall be done on certified platform scales sealed by the State Inspector or the City Sealer of Weights and Measures as defined by Arizona Revised Statutes Sections 44-2112 and 44-2116. The Contractor shall furnish the Engineer with duplicate Weighmaster's Certificates showing the actual net weights together with the information required by Arizona Revised Statutes Section 44-2142. The Contractor shall furnish the Engineer with duplicate Weighmaster's Certificates at the time of delivery unless the Engineer designates a different submittal time. The Contracting Agency will accept the certificates as evidence of the weight delivered.

Payment for the various items in the proposal will be made at the unit price bid in the proposal, and shall be compensation in full for furnishing all labor, materials, equipment and appurtenances necessary to complete the work in a satisfactory manner as shown on the plans and as required in the specifications, with all connections, testing, and related work completed. Each item, fixture, piece of equipment, etc., shall be complete with all necessary connections and appurtenances, for the satisfactory use and operation of said item. No additional payment will be made for work related to any item unless specifically called for in the proposal. This compensation shall also cover all risk, loss, damage or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the provisions of Section 107.

#### 109.3 ASSIGNMENT OF PAYMENTS:

The Contractor shall not assign payments of a contract or any portion thereof without approval of surety and written consent of the Contracting Agency.

## SECTION 109

Claims for monies due or to become due the Contractor may be assigned to a bank, trust company, or other financing institution, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Any assignment of money shall be subject to all proper setoffs and withholdings in favor of the Contracting Agency and to all deductions provided for in these specifications.

### 109.4 COMPENSATION FOR ALTERATION OF WORK:

#### \*109.4.1 By The Contracting Agency:

(A) For a decrease greater than 20 percent in either the total cost of the contract or the total cost of a major item and when a reasonable cost analysis supports an increase in the pro rata share of fixed cost chargeable to this item in total, an increase adjustment in the monies due the Contractor may be made. This adjusted compensation will not exceed 80 percent of the original lump sum contract amount or, if for a unit price item, the adjustment will not exceed 80 percent of the original extended unit bid price. This does not apply to items labeled as contingent bid item in the bid proposal.

(B) For an increase greater than 20 percent, any adjustment made will only apply to that cost in excess of 120 percent of the original bidding schedule. If either party presents a reasonable cost analysis that shows a change in the pro rata share of fixed costs chargeable to this item in total, an increase or decrease adjustment will be made. This increase or decrease adjustment will be made on such basis as is necessary to cover a reasonable estimate of cost, plus an allowance, not to exceed 15 percent, for overhead and profit. If the parties are unable to reach an agreement, the Engineer has the authority to order the excess work done on an actual cost basis as specified in Subsection 109.5.

(C) For either an increase or decrease in cost, no claim shall be made by the Contractor for any loss of anticipated profits.

#### \*109.4.2 Due to Physical Conditions:

(A) If the Engineer, after his investigation of the site conditions, agrees that they materially differ from those indicated in the contract and would cause an increase in the Contractor's bid cost of accomplishing the work, new unit bid prices or a lump sum cost (for the additional work only) may be negotiated. If the parties are unable to reach an agreement on price, the Engineer has the authority to order this additional work accomplished on an actual cost basis as specified in Subsection 109.5.

(B) If the Engineer, after his investigation of the site conditions, finds that these conditions do not materially differ from those indicated in the contract, he has the authority to order the work to be accomplished at the original bid price(s).

**\*109.4.3 Due to Extra Work:** If the Contractor can present valid, factual evidence, satisfactory to the Engineer, that the work in question is an item not provided for in the contract as awarded then a unit bid price or lump sum cost, for this item only, may be negotiated. If the parties are unable to reach an agreement on price or cost, the Engineer has the authority to order the extra work accomplished on an actual cost basis as specified in Subsection 109.5.

**109.4.4 Made at the Contractor's Request:** Any alterations, if approved, will be a reduction in cost or at no additional cost to the Contracting Agency.

#### 109.4.5 Due to Failure of Contractor to Properly Maintain the Project:

(A) For any suspension of work during normal working hours due to failure of the Contractor to properly maintain the project, there will be no additional compensation or time allowed.

(B) If the Engineer provides the Contractor with a written order to provide adequate maintenance of traffic, adequate cleanup, adequate dust control or to correct deficiencies resulting from abnormal weather conditions and the Contractor fails to comply in the time frame specified, the Contracting Agency may have the work accomplished by other sources.

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\*Not applicable to Improvement District Projects.

## Page: 2

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● Author: ghaws

Subject: Note

Date: 4/2/2008 10:43:25 AM

All compensation due the Contractor for alteration of work, as outlined in this subsection, shall be documented by a Change Order.

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## SECTION 109

The Contracting Agency will deduct the cost of accomplishing the work from monies due or to become due to the Contractor. Computation of the cost will be in accordance with Subsection 109.5.4.2.

### 109.4.6 Allowable Mark-Ups:

Only the allowable mark-ups as defined in Subsection 109.5 shall be allowed. ~~Additional compensation for other items shall not be considered or allowed.~~

### \*109.5 ACTUAL COST WORK:

The compensation for actual cost work performed by the Contractor (Subcontractor) shall be determined by the Engineer in the following manner.

**109.5.1 Equipment:** For all equipment, the use of which has been authorized by the Engineer, except for small tools and manual equipment, the Contractor will be paid in accordance with the latest Schedule of Equipment Rates used by the Arizona Department of Transportation. Payment for equipment will be made following the calculations in Section 109 of the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction. The value of 0.933 shall be used for the adjustment factor F used in the rental rate formulas ( $F = 0.933$ ).

**109.5.2 Material:** For all material, accepted by the Engineer and used in the work, the Contractor will be paid the actual cost of such material including transportation cost, to which total cost will be added a sum equal to 15 percent thereof.

**109.5.3 Labor:** For all labor and for the foreman, when he is in direct charge of the operation, the Contractor will be paid:

(A) The actual wages paid plus the current percentage thereof as determined by the Arizona Department of Transportation which is deemed to cover the Contractor's cost incurred as a result of payment imposed by State or Federal Law and payments that are made to, or on behalf of, the workman other than the actual wage. Actual wage is defined as the required current hourly rate paid to the labor classification concerned and does not include any fringe benefits or dislocation allowances. If the Contractor is not required to pay fringe benefits equivalent to the Current rates published in the Federal Register, an equitable deduction will be made from the current percentage established by the Arizona Department of Transportation.

(B) For the first \$50,000 of labor cost computed under paragraph (A) above, the Contractor will be paid an amount equal to (15) fifteen percent for overhead and profit.

(C) For all labor cost computed under paragraph (A) above, in excess of \$50,000 but not exceeding \$100,000, the Contractor will be paid an amount equal to (12) twelve percent for overhead and profit.

(D) For any labor cost computed under paragraph (A) above in excess of \$100,000 the Contractor will be paid an amount equal to (10) ten percent for overhead and profit.

### 109.5.4 Work Performed by Subcontractors or Other Sources:

**109.5.4.1 Work Performed by Subcontractors:** If it is determined by the Engineer that portions of the Actual Cost Work to be performed requires specialized labor or equipment not normally used by the Contractor and such work is then authorized to be performed by a subcontractor(s), the subcontractor(s) will be paid by the Contractor in accordance with the actual cost work procedures outlined herein. The Contractor will be paid by the Contracting Agency the full amount of the subcontract plus the following percentages for administration and supervision.

(A) For the first \$10,000 accumulated total of all change order work performed by subcontractors (less mark-up for overhead and profit), the Contractor will be paid an amount equal to 10 percent of the accumulated total for administration and supervision. If the accumulated total is \$3,000 or less, the Contractor will be paid \$300 for administration and supervision.

(B) For all change order work in excess of \$10,000 accumulated total performed by subcontractors (less mark-up for overhead and profit), the Contractor will be paid an amount equal to five percent of the accumulated total for administration and supervision.


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\*Not applicable to Improvement District Projects.

● Author: ghaws

Subject: Replacement Text

Date: 4/2/2008 10:44:11 AM

 Additional compensation for other items, including extended overhead and conditions, shall not be considered or allowed.

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## SECTION 109

**109.5.4.2 Work Performed by Other Sources:** If the Contracting Agency has work performed by other sources, in accordance with Subsection 109.4.5 (B), the Contracting Agency will deduct, from monies due or to become due to the Contractor, the full amount of the cost of accomplishing the work by other sources plus the following percentages for administration and supervision:

(A) For the first \$10,000 accumulated total of work performed by other sources, the Contracting Agency will deduct an amount equal to 10 percent of the accumulated total for administration and supervision. If the accumulated total is \$3,000 or less, the Contracting Agency will deduct \$300 for administration and supervision.

(B) For all work in excess of \$10,000 accumulated total performed by other sources, the Contracting Agency will deduct an amount equal to 5 percent of the accumulated total for administration and supervision.

### **109.5.5 Documentation:**

(A) Except in emergency situations, the Contracting Agency will not be liable for any Actual Cost Work performed by the Contractor prior to written authorization by the Engineer or prior to full execution of a written agreement by all parties concerned.

(B) Payment for work performed on an actual cost basis will not be made until the Contractor has furnished the Engineer, on forms agreed to by the Contracting Agency, duplicate itemized statements of such work, including subcontractor(s) costs, detailed as follows:

- (1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.
- (2) Designation, dates, daily hours, total hours, rental rates and extension for each unit of equipment, and machinery.
- (3) Quantities of material, prices, extension and transportation cost on a daily basis. These charges shall be substantiated by vendor invoices.

(C) The Engineer will compare his records with the statement furnished by the Contractor, resolving any differences and making the required adjustments. This statement when agreed upon and signed by both parties, shall be the basis of payment for the work performed.

**109.5.6 Bonds and Insurance:** The Contractor shall be paid for the actual cost plus (10%) ten percent for Administrative cost when the Contractor can provide evidence of payment for premiums on required payment and performance bonds, premiums on railroad and/or airport extended liability insurance, and premiums for property damage and/or public liability insurance. No duplication of payment for Contractor's costs included under Subsection 109.5.3(A) will be allowed.

**109.5.7 Authority of Engineer:** The Engineer is in charge of Actual Cost Work and has the authority to direct which labor and equipment will be used, to suspend operations, and to refuse to pay for any labor or equipment which he feels is not doing productive work.

### **109.6 PAYMENT FOR IMPROVEMENT DISTRICT PROJECTS:**

Payment to the Contractor shall be made in accordance with ARS Sections 48-523 to 48-613, both inclusive.

As soon as the Contractor has fulfilled his contract, the Superintendent of Streets shall estimate the benefits arising from the work and make assessments to cover the work performed and specified in the contract, including incidental expenses in accordance with ARS Section 48-589.

The Contractor agrees to accept payment in the form of Assessments with attached Warrants and/or Improvement Bonds at the rate of interest declared in the resolution of intention prepared by the Contracting Agency.



## SECTION 109

### **\*109.7 PAYMENT FOR BOND ISSUE AND BUDGET PROJECTS:**

(A) Partial Payments: The Contracting Agency will make a partial payment to the Contractor on the basis of an estimate prepared by the Contractor or Engineer for work completed through the last day of the preceding calendar month. Payment will be within 14 calendar days after the estimate has been certified and approved by the Engineer and received by the owner.

The Contracting Agency will retain 10 percent of all estimates as a guarantee for complete performance of the contract in accordance with Arizona Revised Statutes Section 34-221 or 34-607, unless the Contractor elects to deposit securities in accordance with Arizona Revised Statutes Section 34-221, Paragraph C.5. or 34-607, Paragraph B.5.

When the Contractor is fifty percent completed, one-half of the amount retained shall be paid to the Contractor provided he is making satisfactory progress on the contract and there is no specific cause or claim requiring a greater amount to be retained. After the contract is fifty percent completed, no more than five percent of the amount of any subsequent progress payments made under the contract will be retained providing the Contractor is making satisfactory progress on the project. Except that, if at any time the owner determines satisfactory progress is not being made, ten percent retention shall be reinstated for all progress payments made under the contract subsequent to the determination.

Any material or equipment which will become an integral part of the completed project will be considered for partial payment in the Contractor's monthly progress payments. The intent of making partial payments is to provide the Contractor payment for direct material or equipment purchased. The purpose is to minimize the effect of escalating costs by procuring key materials. It is not the intent to pay for all materials but only those meeting the following conditions.

- (1) A total value of all items requested for payment must be greater than \$20,000. No payment will be processed until the material or equipment has been observed, reviewed or verified by the Contracting Agent representative. Only the material or equipment meeting the requirements of the plans and specifications will be paid. Payment for material or equipment does not constitute final acceptance.
- (2) Materials or equipment must be stored or stockpiled either on site, in a warehouse, or secured storage area. The Contractor assumes all responsibility for protection of these materials or equipment and shall insure them to cover loss or damage to same without additional liability or added costs to the Agency for providing this security, insurance, and storage.
- (3) The Contractor will provide access to the storage area or warehouse upon request of the Contracting Agent's representative for the purpose of verifying the inventory of items paid for under this section. None of the materials or equipment paid for under this section will be removed from the storage site until incorporated into the work of the project. The storage site shall be within the general geographical area of the project.
- (4) The Contractor shall provide a paid invoice and/or lien waiver for items paid for under this section. The Agency will not pay more than the invoice price for the item or items, less retention.
- (5) The Engineer may exclude individual payment requests which in the Engineer's judgement do not warrant storage and prepayment under the intent of this section.

(B) Final Payment: When the project has been accepted as provided in Section 105, and within 30 calendar days after final inspection of the work completed under the contract, the Engineer will render to the Contracting Agency and the Contractor, a final estimate which will show the amount of work performed and accepted under the contract. All prior estimates and partial payments will be subject to correction in the final estimate for payment.

Within sixty (60) calendar days after final acceptance, the Contracting Agency will pay the Contractor all amounts due him under the contract, except that before final payment will be made, the Contractor shall satisfy the Contracting Agency by affidavit that all bills for labor and materials incorporated in the work have been paid. The Contractor's Affidavit may be obtained from the Engineering Office of the Contracting Agency.

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\*Not applicable to Improvement District Projects.

## SECTION 109

If payment will be longer than 60 days after final completion and acceptance, the owner will provide the Contractor specific written findings for reasons justifying the delay in payment.

The acceptance of the project and the making of the final payment shall not constitute a waiver by the Contracting Agency/Owner of any claims arising from faulty or defective work appearing after the completion or from failure of the Contractor to comply with the requirements of the contract documents.

### 109.8 PAYMENT FOR DELAY:

The procedures contained in this Subsection shall not be construed to void any provision of the contract which require notice of delays, provides for negotiation of other procedures for settlement or provide for liquidated damages.

**109.8.1 Failure to Locate or Incorrect Location of Utilities:** Arizona Revised Statutes 40-360 states "that if the owner or operator fails to locate or incorrectly locates the underground facility, pursuant to this article, the owner or operator becomes liable for resulting damages, costs and expense to the injured party." The Contracting Agency will deny any claims for damages or delays if another owner or operator is at fault.

**109.8.2 Contracting Agency Delays:** Arizona Revised Statutes 34-221 states "A contract for the procurement of construction shall include a provision which provides for negotiations between the Agent and the Contractor for the recovery of damages related to expenses incurred by the Contractor for a delay for which the Agent is responsible, which is unreasonable under the circumstances and which was not within the contemplation of the parties to the contract."

In this case, if the Contractor sustains damages which could not have been avoided by the judicious handling of forces, equipment and plant or by reasonable revision in the Contractor's schedule of operation, the compensation for such damages will be negotiated. The Contractor shall notify the Engineer of the condition in writing by the next work day. Failure to notify the Engineer within this time may be just cause to reject any claims for such damages.

Compensation for such damages will be negotiated as follows:

(A) The Engineer shall be satisfied that the Contractor has made every reasonable effort to prosecute the work despite any delays encountered or revisions in the Contractor's scheduling of work.

(B) The Compensation paid to the Contractor shall be in accordance with Section 109.

**109.8.3 Extension of Contract Time:** For any such delays, the contract time will be adjusted in accordance with Subsection 108.7.

### 109.9 DOLLAR VALUE OF MAJOR ITEM:

TABLE 109-1	
DOLLAR VALUE OF MAJOR ITEM	
Original Contract Amount	Dollar Value of Major Item
\$0.00 to \$1,000,000.00	\$50,000 or 10% of original contract amount, whichever is less
\$1,000,000.00 to \$5,000,000.00	5.0% of original contract amount
\$5,000,000.00 or greater	\$250,000.00 or 2.5% of original contract amount, whichever is greater

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End of Section

Revised Case 08-08a  
Date 4-2-08  
G. Haws, City of Mesa

## SECTION 301

### SUBGRADE PREPARATION

#### 301.1 DESCRIPTION:

This section shall govern the preparation of natural, or excavated areas prior to the placement of sub-base material, pavement, curbs and gutters, driveways, sidewalks or other structures. It shall include stripping and disposal of all unsuitable material including existing pavement and obstructions such as stumps, roots, rocks, etc., from the area to be paved.

#### 301.2 PREPARATION OF SUBGRADE:

With the exception of areas where compacted fills have been constructed as specified in Section 211 in the areas where new construction is required the moisture content shall be brought to that required for compaction by the addition of water, by the addition and blending of dry, suitable material or by the drying of existing material. The material shall then be compacted to the specified relative density. If pumping subgrade should become evident at any time prior to paving, the Engineer may require proof rolling with a pneumatic-tire roller or other approved equipment in order to identify the limits of the unacceptable area. The proof rolling will be performed at no additional cost to the Contracting Agency.

#### 301.3 RELATIVE COMPACTION:

The subgrade shall be scarified and loosened to a depth of 6 inches. When fill material is required, a layer of approximately 3 inches may be spread and compacted with the subgrade material to provide a better bond. The subgrade cut and fill areas shall be constructed to achieve a uniform soil structure having the following minimum dry density when tested in accordance with AASHTO T-99, Method A, and T-191 or ASTM D-2922 and D-3017 with the percent of density adjusted in accordance with the rock correction procedures for maximum density determination, standard detail, to compensate for the rock content larger than that which will pass a No. 4 sieve.

(A) All Streets	95 percent
(B) Other traffic ways	90 percent
(C) Curbs, gutters and sidewalks	85 percent

#### 301.4 SUBGRADE TOLERANCES:

Subgrade upon which pavement, sidewalk, curb and gutter, driveways, or other structures are to be directly placed shall not vary more than 1/4 inch from the specified grade and cross-section. Subgrade upon which sub-base or base material is to be placed shall not vary more than 3/4 inch from the specified grade and cross-section. Variations within the above specified tolerances shall be compensating so that the average grade and cross-section specified are met.

#### 301.5 GRADING OF AREAS NOT TO BE PAVED:

Areas where grade only is called for on the plan shall be graded to meet the tolerances for the subgrade where sub-base or base material is to be placed. The surface shall be constructed to a straight grade from the finished pavement elevations shown on the plans to the elevation of the existing ground at the extremities of the area to be graded.

#### 301.6 PROTECTION OF EXISTING FACILITIES:

The Contractor shall exercise extreme caution to prevent debris from falling into manholes or other structures. In the event that debris should fall into a structure it shall immediately be removed.

#### 301.7 MEASUREMENT:

Measurement for grading under pavement will be by the square yard.

#### 301.8 PAYMENT:

Payment for this grading work will be made only when it is performed for street or roadway paving projects. Payment for necessary grading for items outside of the lip of gutter shall be included in the cost of those items.

Payment will be made at the unit price bid per square yard, and such payment shall be compensation in full for the item complete in place, including stripping, excavating, hauling, filling, compacting, and disposing of excess or unsuitable materials, together with all costs incidental thereto.

End of Section

# Summary of Comments on S:\...\Table of Contents. [PFP#1170401788]

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● Author: ghaws

Subject: Note

Date: 4/2/2008 10:45:34 AM

All compaction shall be performed within 2 percent of the optimum moisture content.

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● Author: ghaws

Subject: Replacement Text

Date: 4/2/2008 10:46:08 AM

TA 95 percent

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● Author: ghaws

Subject: Replacement Text

Date: 4/2/2008 10:46:59 AM

TA (C) Curbs and gutters.....95 percent

TA(D) Sidewalks .....90 percent

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*Revised Case 08-086  
 Date 4-2-08  
 G. Harris, City of Mesa  
 → Change only to page 4*

## SECTION 601

### TRENCH EXCAVATION, BACKFILLING AND COMPACTION

#### 601.1 DESCRIPTION:

The work covered by this specification consists of furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with the excavation and backfilling of trenches for a single pipe installation in accordance with the plans and special provisions, except for the installation of high density polyethylene pipe (HDPE). See Section 603 for trench excavation, backfilling, and compaction of HDPE pipe.

Excavation for appurtenance structures, such as manholes, inlets, transition structures, junction structures, vaults, valve boxes, catch basins, etc., shall be deemed to be in the category of trench excavation.

#### 601.2 EXCAVATION:

**601.2.1 General:** The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the plans, and including excavation ordered by the Engineer of compacted backfill for the purpose of making density tests on any portion of the backfill.

All excavation shall be open cut unless otherwise shown on the plans or approved by the Engineer.

**601.2.2 Trench Widths:** Trenches for other than cast-in-place concrete pipe shall conform to the dimensions in Table 601-1, unless otherwise specified in the special provisions, indicated on the plans, and/or approved by the Engineer.

TABLE 601-1		
TRENCH WIDTHS		
Size Of Pipe (I.D.)	Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel	Minimum Width At Springline Each Side of Pipe (1)
Less than 18 inches	16 inches	6 inches
18 inches to 24 inches inclusive	19 inches	7 1/2 inches
27 inches to 39 inches inclusive	22 inches	9 inches
42 inches to 60 inches inclusive	1/2 O.D.	12 inches
Over 60 inches	36 inches	12 inches

(1) When the specified compaction cannot be obtained in the haunch area and/or bedding zone, the Contractor shall make necessary changes in his methods and/or equipment to obtain the desired results. In some instances, the Minimum Width at Springline shall be adjusted wider to assist the Contractor in obtaining the compaction. The Engineer must be satisfied with the Contractor's compaction effort, concur with the change and approve the revised distance. There shall be no additional cost to the Agency for the extra trench width.

For multiple pipe installations in a single trench, the Engineer shall provide details on the plans or in the Special/Technical Provisions as to the layout, pipe configuration, distances between pipes and trench walls, the type of backfill, bedding and foundation materials, etc.

The width of the trench shall not be greater than the maximum indicated in Table 601-1, at and below the level of the top of the pipe. The width of the trench above that level may be made as wide as necessary for sheeting and bracing, and for proper installation of the work.

If the maximum trench width as specified in Table 601-1 is exceeded at the top of the pipe the Contractor shall provide, at no additional cost to the Contracting Agency, the necessary additional load bearing capacity by means of bedding, having a higher

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bedding factor than that specified, higher strength pipe, a concrete cradle, cap or encasement, or by other means approved in writing by the Engineer.

**601.2.3 Trench Grade:** Alignment and elevation stakes shall be furnished the Contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Engineer will also furnish the Contractor with cut sheets.

For all pipe 12 inches or greater in diameter, the Contractor shall excavate for and provide an initial granular bedding at least 4 inches thick or 1/12 the O.D. of the pipe whichever is greater. This bedding material shall be placed at a uniform density with minimum compaction and fine graded as specified below.

Bell or coupling holes shall be dug after the trench bottom has been graded. Such holes shall be of sufficient width to provide ample room for caulking, banding, or bolting. Holes shall be excavated only as necessary to permit accurate work in the making of the joints and to insure that the pipe will rest upon the prepared bottom of the trench, and not be supported by any portion of the joint.

Depressions for joints, other than bell-and-spigot, shall be made in accordance with the recommendations of the joint manufacturer for the particular joint used.

**601.2.4 Fine Grading:** Unless otherwise specified in the plans and/or special provisions, the bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe at every point along its entire length, except for portions of the pipe where it is necessary to excavate for bells and for proper sealing of the pipe joints.

**601.2.5 Overexcavation:** Except at locations where excavation of rock from the bottom of the trench is required, care shall be taken not to excavate below the depth indicated.

Unauthorized excavation below the specified grade line shall be refilled at the Contractor's expense with ABC material compacted to a uniform density of not less than 95 percent of the maximum density as determined by AASHTO T-99 and T-191 or ASTM D-2922 and D-3017. When AASHTO T-99, method A or B, and T-191 are used for density determination, MAG Detail 190 will be used for rock correction.

Whenever rock is encountered in the trench bottom, it shall be overexcavated to a minimum depth of six inches below the O.D. of the pipe. This overexcavation shall be filled with granular material placed with the minimum possible compaction.

Whenever unsuitable soil incapable of supporting the pipe is encountered, the Contractor will notify the Engineer and a field determination will be made as to the depth of overexcavation and the granular fill required.

**601.2.6 Excavation for Manholes, Valves, Inlets, Catch Basins and Other Accessories:** The Contractor may excavate to place the concrete structure directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing or if precast structures are used, the Contractor shall overexcavate to place the structure and this overexcavation shall be backfilled with the same material required for the adjoining pipe line trench and compacted per Table 601-2.

Any unnecessary excavation below the elevation indicated for the foundation of any structure shall be replaced with the same class of concrete specified for the structure or with 1 1/2 sack controlled low strength material as specified in Section 728. When the replacement material is structural concrete, the material shall be placed at the same time as the structure. However, when using 1 1/2 sack controlled low strength material, placement of the material shall be per Section 604 which will require a time lag between the material and the structural concrete. The placement of the additional material shall be at no cost to the Agency.

**601.2.7 Pavement and Concrete Cutting and Removal:** Where trenches lie within the portland cement concrete section of streets, alleys, driveways, or sidewalks, etc., such concrete shall be sawcut to neat, vertical, true lines in such a manner that the adjoining surface will not be damaged. The minimum depth of cut shall be 1 1/2 inches or 1/4 of the thickness, whichever is greater.

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Asphalt pavement shall be clean-cut, with approved equipment and by approved methods in accordance with the requirements of Section 336.

No ripping or rooting will be permitted outside limits of cuts. Surfacing materials removed shall be hauled from the job site immediately, and will not be permitted in the backfill.

**601.2.8 Grading and Stockpiling:** All grading in the vicinity of trench excavation shall be controlled to prevent surface water from flowing into the trenches. Any water accumulated in the trenches shall be removed by pumping or by other approved methods.

During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance back from the edges of trenches, to avoid overloading and to prevent slides or cave-ins. Material unsuitable for backfilling, or excess material, shall be hauled from the job site and disposed of by the Contractor.

The Contractor shall, prior to final acceptance of the work, submit a letter to the Contracting Agency stating the location of each disposal site for all excess or unsuitable material and certify that he has obtained the property owner's permission for the disposal of all such materials.

Where the plans and/or special provisions provide for segregation of topsoil from underlying material for purposes of backfill, the material shall not be mixed.

**601.2.9 Shoring and Sheeting:** The Contractor shall do such trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to governing laws. The bracing, sheathing, or shoring shall not be removed in one operation but shall be done in successive stages as determined by the Engineer to prevent overloading of the pipe during backfilling operations. The cost of the bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid for the pipe.

All shoring and sheeting deemed necessary to protect the excavation and to safeguard employees, shall be installed. See Section 107.

**601.2.10 Oper. Trench:** Except where otherwise noted in the special provisions, or approved in writing by the Engineer, the maximum length of open trench, where the construction is in any stage of completion (excavation, pipe laying or backfilling), shall not exceed 1320 feet in the aggregate at any one location.

Any excavated area shall be considered open trench until all ABC for pavement replacement has been placed and compacted. With the approval of the Engineer, pipe laying may be carried on at more than one separate location, the restrictions on open trench applying to each location. Trenches across streets shall be completely backfilled as soon as possible after pipe laying.

Substantial steel plates with adequate trench bracing shall be used to bridge across trenches at street crossings where trench backfill and temporary patches have not been completed during regular work hours. Safe and convenient passage for pedestrians shall be provided. The Engineer may designate a passage to be provided at any point he deems necessary. Access to hospitals, fire stations and fire hydrants must be maintained at all times.

### 601.3 PROTECTION OF EXISTING UTILITIES:

**601.3.1 Utilities:** Unless otherwise shown on the plans or stated in the specifications, all utilities, both underground or overhead, shall be maintained in continuous service throughout the entire contract period. The Contractor shall be responsible and liable for any damages to or interruption of service caused by the construction.

If the Contractor desires to simplify his operation by temporarily or permanently relocating or shutting down any utility or appurtenance, he shall make the necessary arrangements and agreements with the owner and shall be completely responsible for all costs concerned with the relocation or shutdown and reconstruction. All property shall be reconstructed in its original or new location as soon as possible and to a condition at least as good as its previous condition. This cycle of relocation or shutdown and reconstruction shall be subject to inspection and approval by both the Engineer and the owner of the utility.

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The Contractor shall be entirely responsible for safeguarding and maintaining all conflicting utilities that are shown on the plans (Sections 107 and 105 apply). This includes overhead wires and cables and their supporting poles whether they are inside or outside of the open trench. If, in the course of work, a conflicting utility line that was not shown on the plans is discovered, the Contracting Agency will either negotiate with the owner for relocation, relocate the utility, change the alignment and grade of the trench or as a last resort, declare the conflict as "extra work" to be accomplished by the Contractor in accordance with Section 104.

**601.3.2 Irrigation Ditches, Pipes and Structures:** The Contractor shall contact the owners of all irrigation facilities, and make arrangements for necessary construction clearances and/or dry-up periods.

All irrigation ditches, dikes, headgates, pipe, valves, checks, etc., damaged or removed by the Contractor, shall be restored to their original condition or better, by the Contractor at no additional cost to the Contracting Agency.

**601.3.3 Building, Foundations and Structures:** Where trenches are located adjacent to building, foundations, and structures, the Contractor shall take all necessary precaution against damage to them. The Contractor shall be liable for any damage caused by the construction.

Except where authorized in the special provisions or in writing by the Engineer, water settling of backfill material in trenches adjacent to structures will not be permitted.

**601.3.4 Permanent Pipe Supports:** Permanent pipe supports for the various types and sizes of sewer, water and utility lines shall conform to the Standard Details or the details shown on the plans. Such pipe supports shall be erected at the locations shown on the plans and/or at any other locations as necessary as determined by the Engineer.

**601.3.5 Electronic, Telephonic, Telegraphic, Electrical, Oil and Gas Lines:** These underground facilities shall be adequately supported by the Contractor. Support for plastic pipes shall be continuous along the bottom of the pipe. Support for metal pipe and electrical conduit may be continuous or nylon webbing may be used for suspension at no greater than ten-foot intervals.

The Contractor shall avoid damaging the plastic pipe, pipeways or conduits during trench backfilling and during foundation and bedding placement.

There will be no measurement or payment for this work. The Contractor will include all associated costs in the unit bid price for the conduit installation.

### 601.4 FOUNDATION, BEDDING, BACKFILLING AND COMPACTION:

**601.4.1 Foundation:** The material upon which the conduit or structure is to be placed shall be accurately finished to the grade or dimensions shown on the plans or as directed by the Engineer. The bottom portion of the trench shall be brought to grade so that the conduit or structure will be continuously in contact with the material on which it is being placed. If rocky or unsuitable soil is encountered, Subsection 601.2.5 applies.

**601.4.2 Bedding:** Bedding shall consist of granular material containing no pieces larger than 1 1/2 inches and free of broken concrete, broken pavement, wood or other deleterious material. Open graded rock will not be used without the written approval of the Engineer.

Where water consolidation is used, bedding for conduits, 24 inches or less in I.D., may be placed in one lift. For larger conduits the first lift shall not exceed the springline of the pipe.

Where mechanical compaction is used, the moisture content shall be such that the specified compaction can be obtained. The first lift shall be 8 inches or two-thirds of the distance to the springline whichever is greater. Succeeding lifts shall not exceed 2 feet loose and extreme care will be taken to prevent damage to or movement of the conduit by the compaction equipment.

**601.4.3 Backfill:** Backfill shall be sound earthen material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, this may be native material with no piece larger than 4 inches, select material or aggregate base course. Backfill under street pavement shall be constructed per Detail 200 with the type of replacement noted on the plans



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For all compaction discussed in this section, moisture content shall be performed within 2 percent of optimum.

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or in the special provisions. Unless otherwise noted, backfill under single curb, curb and gutter, sidewalk, driveways, valley gutters, etc. shall be the same as the adjacent street pavement.

Where water consolidation is used, backfill will be placed in lifts as required in the following table prior to settlement.

Trench Width	Backfill Lifts
18" to 24"	Not to exceed 4'
25" to 36"	Not to exceed 6'
Over 36"	Not to exceed 8'

The above backfill lift limitations are not applicable when water saturation is done by the jetting method.

Where mechanical compaction is used, backfill shall be placed in lifts the height of which shall not exceed that which can be effectively compacted depending on the type of material, type of equipment and methods used, and under no circumstances shall exceed 4 feet.

Backfill, around utilities that are exposed during trench excavation, shall be placed in accordance with the bedding methods.

**601.4.4 Compaction Densities:** Unless otherwise provided in the plans and/or special provisions, the trench backfill shall be thoroughly compacted to not less than the densities in Table 601-2 when tested and determined by AASHTO T-99 and T-191 or ASTM D-2922 and D-3017. When AASHTO T-99, method A or B, and T-191 are used for density determination, MAG Detail 190 will be used for rock correction.

The density required will depend on the Type shown on the plans and/or called for in the special provisions. Density required for each type shall comply to Table 601-2.

TABLE 601-2				
MINIMUM TRENCH COMPACTION DENSITIES				
Backfill Type	Location	From Surface To 2 feet Below Surface	From 2 feet Below Surface To 1 foot Above Top of Pipe	From 1 foot Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above.	100% for granular 95% for non-granular	90%	90%
II	On any utility easement street, road or alley right-of-way outside limits of (I).	85%	85%	90%
III	Around any structures or exposed utilities.	95% in all cases		

**Note:** The type required will generally be shown on the plans and the plans will govern. Where no type is shown on the plans the type shall comply with Table 601-2.

A consideration in determining the backfill Types as shown on the plans, is based on the trench widths as shown in the Contract Documents. If these trench widths increase beyond those widths referred to above and fall within the 2-foot limit of paved surfaces and other improvements due to construction exigencies, the backfill designation for that portion within the 2-foot limit of such improvements shall be Type I even though Type II backfill is shown on the plans.

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**601.4.5 Compaction Methods:** Water consolidation by jetting shall be accomplished with a 1 1/2 inches pipe of sufficient length to reach the bottom of the lift being settled with adequate hose attached and a water pressure of not less than 30 psi. All jetting shall be accomplished traversely across the trench at intervals of not more than 6 feet with the jetting locations on one side of the trench offset to the jetting locations on the other side of the trench. The entire lift shall be leveled and completely saturated working from the top to the bottom.

Jetting shall be used as the consolidation method for all conduit bedding. The Contractor shall be entirely responsible for establishing each lift depth so as to avoid floating the conduit being placed and shall make any repair or replacement at no cost to the Contracting Agency. However, for conduit larger than 24 inches I.D. the first lift shall not exceed the springline of the conduit.

Flooding is not acceptable as a water consolidation method unless authorized in the specification or by a written change order. It will consist of the inundation of the entire lift with water and then puddled with poles or bars to insure saturation of the entire lift.

Where jetting or flooding is utilized and the surrounding material is such that it does not permit proper drainage, the Contractor shall provide, at his expense a sump and a pump at the downstream end to remove the accumulated water.

The use of water consolidation does not relieve the Contractor from the responsibility to make his own determination that such methods will not result in damage to existing improvements. The Contractor shall be responsible for any damage incurred.

Where water consolidation is not permitted or does not result in adequate compaction, the backfill material shall be compacted with hand and/or mechanical work methods using equipment such as rollers, pneumatic tamps, and hydro-hammers or other approved devices which secure uniform and required density without injury to the pipe or related structures.

Where Type I backfill is required, water consolidation will not be permitted for non-granular material, except in the following situation. In a new development prior to paving and prior to opening the area to public traffic, water consolidation, will be permitted for non-granular material at the Contractor's discretion and responsibility.

**601.4.6 Specifications for Granular Material:** For purposes of this specification, granular material shall mean material for which the sum of the plasticity index and the percent of the material passing a No. 200 sieve shall not exceed 23. The plasticity index shall be tested in accordance with AASHTO T-146 Method A (Wet Preparation), T-89 and T-90.

**601.4.7 Rights-Of-Way Belonging to Others:** Backfill and compaction for irrigation lines of the Salt River Valley Water Users' Association and Roosevelt Irrigation Districts and for trenches in State of Arizona and Maricopa County rights-of-way outside the limits of the Contracting Agency shall be accomplished in accordance with their permit and/or specifications.

**601.4.8 Test Holes:** Boring logs shown on the plans do not constitute a part of the contract and are included for the Contractor's convenience only. It is not intended to imply that the character of the material is the same as that shown on the logs at any point other than that where the boring was made. The Contractor shall satisfy himself regarding the character and amount of rock, gravel, sand, silt, clay and water to be encountered in the work to be performed.

**601.4.9 Foundation and Bedding for Electronic, Telephonic, Telegraphic, Electrical, Oil and Gas Lines:** Foundation and bedding for these underground facilities shall be native material or sand which conforms to the grading requirement of ASTM C-33 for fine aggregate. When backfill material consists of aggregate base course, crushed stone, or other material containing stones, only sand will be used for foundation, and bedding. The foundation depth shall be six inches and bedding depth shall be one foot above the top of the facility. Compaction will be in accordance with Section 601.

### 601.5 CONTRACTOR CERTIFICATION OF INSTALLATION PROCEDURES:

When requested in the Special Provisions or by the Engineer prior to installation, the Contractor shall furnish to the Contracting Agency an affidavit (certification) from the pipe manufacturer (or his designee) stating that the Contractor is familiar with the manufacturer's suggested installation methods and procedures and the installation complies with those procedures and is consistent with MAG requirements.

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Also, when required in the Special/Technical Provisions or requested by the Engineer, the pipe manufacturer or his designee will review the Contractor's methods and procedures for pipe installation in the field. The Contractor will make any adjustments in the installation as recommended by the manufacturer or his representative. If necessary, the Contractor may be required to reinstall or provide corrections to pipe installed prior to the field review at no cost to the Agency. Once the manufacturer or his representative has reviewed the Contractor's installation methods and the Contractor has adjusted his installation methods as recommended by the same, the manufacturer or his representative shall furnish to the Contracting Agency an affidavit (certification) that the Contractor's installation methods and procedures, at the time of the review, complied with the manufacturer's installation practices. The affidavit must provide the name of the manufacturer's representative witnessing the pipe installation.

### 601.6 PAVEMENT REPLACEMENT AND SURFACE RESTORATION:

**601.6.1 Grading:** The Contractor shall do such grading in the area adjacent to backfilled trenches and structures as may be necessary to leave the area in a neat and satisfactory condition approved by the Engineer.

**601.6.2 Restoring Surface:** All streets, alleys, driveways, sidewalks, curbs, or other surfaces, in which the surface is broken into or damaged by the installation of the new work, shall be resurfaced in kind or as specified to the satisfaction of the Engineer in accordance with Section 336.

**601.6.3 Cleanup:** The job site shall be left in a neat and acceptable condition. Excess soil, concrete, etc., shall be removed from the premises.

**601.6.4 Temporary Pavement:** The Contractor shall install temporary asphalt pavement or the first course of permanent pavement replacement in accordance with Section 336 immediately following backfilling and compaction of trenches that have been cut through existing pavement. Except as otherwise provided in Section 336, this preliminary pavement shall be maintained in a safe and reasonably smooth condition until required backfill compaction is obtained and final pavement replacement is ordered by the Engineer. Temporary paving removed shall be hauled from the job site and disposed of by the Contractor at no additional cost to the Contracting Agency.

### 601.7 PAYMENT:

No pay item will be included in the proposal, nor direct payment made for trench excavation, backfilling, compaction, or placement of temporary pavement. The cost of these features of the work shall be included in the unit price bid per linear foot for furnishing and laying pipe.

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End of Section

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<p>CURB, GUTTER, CONCRETE PAVEMENT OR CROSSWALK, DECORATIVE PAVERS, OR EXISTING PATCH</p> <p>REMOVE IF REMNANT IS 24" OR LESS AND RESTORE PER THIS DETAIL</p> <p>TYPE "A" LONGITUDINAL TRENCH (trench in pavement parallel to traffic)</p>	<p>TYPE "B" TRANSVERSE TRENCH (trench in pavement not parallel to traffic)</p>	<p>TYPE "B-MODIFIED"</p>
<p>TYPE "C"</p>	<p>TYPE "D"</p>	<p>TYPE "E"</p>
<p>TYPE "C" (trench in portland cement concrete pavement)</p>	<p>NOTES:</p> <ol style="list-style-type: none"> <li>1. PAVEMENT MATCHING AND SURFACE REPLACEMENT SHALL BE IN ACCORDANCE WITH SECTION 336.</li> <li>2. TYPE OF BACKFILL AND BASE SHALL BE AS SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR ENGINEER.</li> <li>3. TRENCHES LESS THAN 24" WIDE SHALL BE BACKFILLED FROM TOP OF BEDDING TO BOTTOM OF AC BASE COURSE OR ABC BASE (WHICHEVER IS APPLICABLE) WITH CLSM. CEMENT CONTENT SHALL BE 1-SACK PER CUBIC YARD UNLESS OTHERWISE SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR ENGINEER.</li> <li>4. BASE, BACKFILL, BEDDING AND FOUNDATION COMPACTION REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTION 601.</li> <li>5. A.C. BASE AND SURFACE COURSE TO BE AS SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR SECTION 336.2.4.1.</li> <li>6. INCLUDE 12" WIDE BASE LIPS SHOWN IN TYPE "B" AT LONGITUDINAL TRENCH ENDS, EXCEPT WHERE THE EDGE ABUTS EXISTING CONCRETE.</li> <li>7. USE TYPE "B" REPAIR WHENEVER A LONGITUDINAL TRENCH (TYPE "A") CROSSES A STREET OR GOES THROUGH AN INTERSECTION.</li> <li>8. COPPER OR POLYETHYLENE WATER PIPES EXPOSED IN TRENCHES TO BE BACKFILLED WITH CLSM SHALL BE WRAPPED WITH MIN 3/4" THICK CLOSED CELL FOAM INSULATION OR 3/4" WIDE BLACK INSULATION BEFORE PLACING CLSM.</li> </ol>	<p>TYPE "E" (trench in future roadway prism or alley)</p>
<p>DETAIL NO. 200</p>	<p>STANDARD DETAIL ENGLISH</p>	<p>BACKFILL, PAVEMENT AND SURFACE REPLACEMENT</p> <p>REVISED 4/2/08 DRAFT</p> <p>DETAIL NO. 200</p>

## Section 714

## Microsurfacing Materials

## 714.1 GENERAL:

Microsurfacing/microseal shall consist of a properly proportioned mixture of cationic polymer modified asphalt emulsion, mineral aggregates, mineral filler, water, and other additives.

## 714.2 AGGREGATE:

714.2.1 Mineral Filler: Mineral filler, as required by the mix design, shall be any recognized brand of nonairentrained Type I normal Portland cement that is free of lumps and clods, with a minimum of 85% passing the #200 sieve, added by weight of aggregate as specified by the mix design.

714.2.2 Mineral Aggregate: Mineral aggregate shall consist of sound, durable crushed stone or crushed gravel, as per MAG Section 701, and approved mineral filler. The material shall be free from vegetable matter and other deleterious substances. Aggregates shall be 100% crushed with no rounded particles. No natural sand will be allowed. The gradation of mineral aggregate shall conform to Table 714-1.

Table 714-1			
Microseal Aggregate			
Percent Passing			
Sieve Size	Rut Filling	Type III	Type II
1/2	100	100	100
3/8	85-95	100	100
No. 4	55-75	70-90	85-100
No. 8	45-55	45-70	65-90
No. 16	25-10	28-50	45-70
No. 30	19-34	19-34	30-50
No. 50	10-20	12-25	18-30
No. 100	7-18	7-18	10-21
No. 200	5-15	5-15	5-15
Application Rate Pounds/Sq. Yd.	30-35	24-35	18-24

The mineral aggregate and mineral filler shall have a sand equivalency value not less than 50 (ASTM D 2419) and be non-plastic.

If more than one kind of aggregate is used, the correct amount of each kind of aggregate needed to produce the required gradation shall be proportioned separately in a manner that will result in a uniform and homogeneous blend. The final blended aggregate shall meet the requirements for grading, sand equivalency, and plasticity per above.

### 714.3 BITUMINOUS MATERIAL:

The polymerized Cationic Emulsion is herein classified as CSS-1H, quick-setting, cationic type emulsion for mixing applications and seal coats. A minimum of 4% saturated polymer shall be high sheared into the asphalt prior to the emulsification process. The Agency may choose to sample the polymerized asphalt for testing. The amount of polymer will be based on weight of polymer and asphalt (total weight) and be certified by the supplier. The polymerized emulsion will meet the following specifications listed in Table 714-2.

Table 714-2		
Microseal Emulsion		
Test	AASHTO Method	Specification Limits
Tests on Emulsion		
Viscosity, SSF, @ 77°F. sec.	T-59	15-100
Sieve Test, %	T-59	0.10 Maximum
Particle Charge	T-59	Positive
Storage Stability, 24 hr. %	T-59	0.1 Maximum
Evaporation Residue, %	Arizona 512	60 Minimum
Tests on Evaporation Residue Arizona 504		
Kinematic Viscosity 275°F.cst	T-201	650 Minimum
Penetration, 77°F 100g @ 5 sec	T-49	40-90
Softening Point, degrees F.	T-53	140 Minimum
Ductility, 77%, 5 cm/min.	T-51	60 Minimum
Tests on Evaporation Residue after RFTO		
Kinematic Viscosity, 275°F. aging ratio, cst	T-201	2.5 Maximum
Softening Point, degrees F.	T-53	140 Minimum

- \* The emulsion, upon standing undisturbed for a period of twenty-four (24) hours, shall show no white or milky colored substance on its surface, and shall be a homogeneous brown color throughout.

#### 714.4 MODIFIER TYPE AND CONTENT:

The modifier shall be saturated. The use of latex type modifier will be allowed only if both the test results and field performance are accepted by the Engineer. The asphalt cement shall contain a minimum of 4% solid polymer by weight of asphalt residue, sheared into the asphalt prior to emulsification. Plant verification by the Agency, and certification of the polymer content and type by the supplier, will be required throughout the duration of the contract. Each tank of emulsion produced shall be certified as to its compliance with these specifications; this certification shall be provided to the Agency.

#### 714.5 WATER:

Water shall be potable water, free of any injurious impurities. The Contractor shall state the source of water with the bid.

#### 714.6 ADDITIVES:

Additives may be used to accelerate or retard the breaking point and set times of the mix, or to improve the resulting finished surface.

The use of additives in the mix shall be supplied in quantities predetermined by the laboratory mix design.

#### 714.7 TEST CERTIFICATES AND REPORTS:

Test certificates and reports for the bituminous material shall be furnished in accordance with Section 711.3.



SECTION 331 or 361

MICROSEAL SPECIFICATIONS

1. DESCRIPTION

The work covered by this specification consists of furnishing all labor, equipment, and materials for the application of a "quick traffic solid/polymer microsurface."

This specification covers the equipment and construction procedures for rut filling and/or resurfacing of existing paved surfaces. The microsurface shall be a mixture of cationic polymer modified asphalt emulsion, mineral aggregates, mineral filler, water and other additives properly proportioned, mixed and spread on the pavement surface in accordance with this specification and as directed by the Engineer.

2. MATERIALS

The Contractor shall supply all materials necessary for the performance of the work in accordance with the specifications. The asphalt emulsion, aggregate, and mineral filler shall be as specified in Section 714. Materials shall be approved by the Engineer prior to the start of construction. Certificates of Compliance will accompany each delivery of emulsion.

The Contractor shall be responsible for the safety of all materials of which he has taken delivery until they are in place on the road, and shall take all necessary precautions to avoid loss by fire or theft, or damage by water, and shall bear the cost of replacing any such material that is lost, spilt, destroyed or damaged after delivery.

3. PROPORTIONING

The microsurface shall be proportioned in accordance with the mix design. Calibrated sign flowmeters shall be provided to measure both the addition of water and additives to the pugmill. Emulsion and cement flow shall be tied directly to aggregate flow. All additive flows shall be calibrated.

3.1 Performance

The microsurface mixture shall be proportioned per the mix design to ensure:

- a. Trafficability - with a relative humidity at not more than 50% and ambient air temperature of at least 77 degrees F, the material will permit controlled traffic without damage to the surface within thirty (30) minutes and uncontrolled traffic without damage within sixty (60) minutes.
- b. Prevent development of bleeding, raveling, separation or other distress for seven (7) days after placing the microsurface.
- c. The finished mixture will be warranted against material defects for one year; existing conditions excluded.

#### 4. MIX DESIGN

##### 4.1 GENERAL

- 4.1.1 The Contractor shall provide a job mix formula from an approved laboratory and present certified test results for the Engineer's approval. Compatibility of the aggregate and polymer modified emulsion shall be certified by the emulsion manufacturer. All the materials used in the job mix formula shall be representative of the materials proposed by the Contractor for use in the project.
- 4.1.2 All the products used in the construction shall have certifications from the suppliers and they shall be given to the Engineer upon delivery to the project.
- 4.1.3 Mix design and proportioning will be approved by the Engineer prior to the start of the project.

##### 4.2 SPECIFICATIONS

- 4.2.1 The Engineer shall approve the mix design prior to use. The specification limits are as follows:

Residual Asphalt	6%- 11.5% by dry weight of aggregate
Mineral Filler	.1% - 1% by dry weight of aggregate
Polymer Content/Type	4% min. (see Section 714.4)
Additive	As required for mix properties
Water	As required for mix properties
Aggregate Grading	Type as specified meeting Section 4.3
Consistency	2.5 to 3.0 cm
Traffic Time	See Section 6.2.2
Abrasion Loss	75 g/sf max.
Adhesion	90% minimum
Loaded Wheel Sand Adhesion	See Section 4.2.3

#### 4.2.2 MODIFIED COHESION TEST

Furnish laboratory test data showing the mix design to be trafficable thirty (30) minutes after application at 77°F conforming to the following criteria in accordance with test methods described in the applicable specifications.

Set Time Test: 15 minutes                      12 kg-cm minimum.

Early Rolling Traffic Time: 60 minutes    20 kg-cm minimum.

#### 4.2.3 LOADED WHEEL SAND ADHESION TEST

Furnish laboratory test data showing the mix design conforming to the following criteria in accordance with test methods described in the appropriate specifications.

<u>Vehicles/day</u>	<u>Minimum Sand Adhesion</u>
0-30	70 g/ft
250-1500	60 g/ft
1500-3000	55 g/ft
greater than 3000	50 g/ft

- 4.3 The laboratory shall further report the quantitative effects of moisture content in the unit weight of the aggregate (bulking effect). The report must clearly show the theoretical recommended proportion of aggregate, mineral filler (Min. & Max.), water (Min. & Max.), additive(s), and asphalt and how the proportions are based (dry aggregate weight, total mix, etc.).

#### 5. TESTING

Samples will be taken throughout the project for testing by the approved laboratory per ISSA TB101. Testing for asphalt content shall be at the expense of the Agency for the following:

- a. Asphalt content
- b. Aggregate gradation
- c. Percent polymer content and type

## 6. EQUIPMENT

### 6.1 GENERAL

All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

### 6.2 MIXING EQUIPMENT

The mixing machine shall be a self-propelled or truck-mounted mixing machine which shall be able to accurately deliver and proportion the aggregate, mineral filler, water, additive, and polymer-modified asphalt emulsion to a revolving multi-blade mixer capable of minimum speeds of 200 RPM and discharge the product on a continual flow basis. The machine shall have sufficient storage capacity for aggregate, polymer modified asphalt emulsion, mineral filler, water, and additive to maintain an adequate supply to the proportioning controls.

### 6.3 MATERIAL CONTROL

#### 6.3.1 CALIBRATION

Each mixing unit to be used in the performance of the work shall be calibrated prior to construction. Calibration data, if done within the calendar year, using the same material, may be used, providing a verification of the aggregate feed agrees.

Individual volume or weight controls for proportioning each material to be added to the mix shall be provided, and shall be accessible to the Engineer. Each material control device shall be calibrated prior to work and documented for inspection by the Engineer.

#### 6.3.2 AGGREGATE FEED

The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so the amount of aggregate used may be determined at any time.

#### 6.3.3 EMULSION PUMP

The emulsion pump shall be the positive displacement type with a jacketed housing for uniform heating. A revolution counter or similar device shall be fitted so that the amount of emulsion used may be determined at any time.

#### 6.3.4 FINES FEEDER

An approved fines feeder is required that will provide a uniform, positive, accurately metered range of 0 to 1 percent by dry aggregate weight. The fines feeder shall have a counter so the amount of mineral filler can be filler determined at any time.

#### 6.3.5 LIQUID ADDITIVE

The mixing machine shall be equipped with a liquid additive system that provides a pre-determined amount of additive to the mixing chamber. This additive system must be equipped with a counter that can determine the amount used at any time.

#### 6.3.6 WATER SYSTEM

The mixing machine shall be equipped with a water system that provides a pre-determined amount of water to the mixing chamber. This water system must be equipped with a counter that can determine the amount used at any time.

#### 6.4 OPERATOR CONTROLS

Controls will allow the operator to sequence and proportion the material per the mix design.

#### 6.5 SPRAY BARS

The mixing machine shall be equipped with a water pressure system that provides a water spray immediately ahead of and outside the spreader box.

#### 6.6 SPREADING EQUIPMENT

6.6.1 The paving mixture shall be spread uniformly by means of mechanical type laydown box attached to the mixer, equipped with agitation, to spread the materials throughout the box without any dead zones. The paddles shall be designed and operated so all the fresh mix will be agitated. Flexible seals, front and rear, shall be in contact with the road surface to prevent loss of mixture from the box. The spreader box shall be equipped with hydraulic cylinders for controlling the thickness of the spread mixture.

6.6.2 The rut filling spreader box shall have 6 to 8 skids to provide for leveling and filling uneven depressed areas. Two adjustable steel strike-off plates are required. The rear flexible seal shall act a final strike-off and shall be adjustable. The steel strike-offs shall be controlled by hydraulic cylinders placed at the rear of the spreader

box.

6.6.3 The spreading equipment shall be maintained free from build-up of the mixture on the paddles or side walls. Skips, lumps, or tears will not be allowed in the finished product.

## 7. APPLICATION

### 7.1 GENERAL

The microsurface shall be of the desired consistency when deposited in the spreader box and nothing more shall be added to it. The mixing time shall be sufficient to produce a complete and uniform coating of the aggregate and the mixture shall be chuted into the moving spreader box at a sufficient rate to maintain an ample supply across the full width of the strike-off squeegee at all times.

### 7.2 WEATHER

The microsurfacing shall be placed when the temperature is at least 45 degrees F and rising, and it is not raining. The surface temperature shall be 50 degrees F or higher when the mixture is applied.

### 7.3 PROTECTION OF EXISTING SERVICES

The Contractor shall take all necessary precautions to prevent microsurface or other material used from entering or adhering to gratings, hydrants, valve boxes, manhole covers, bridge or culvert decks, and other road fixtures. Immediately after resurfacing, the Contractor shall clean off any such material and leave any grating, manholes, etc. in a satisfactory condition.

### 7.4 FOGGING PAVEMENT

The surface should be pre-wetted by fogging ahead of the spreader box. The rate should be adjusted as dictated by the pavement temperatures, surface texture, humidity, and dryness of existing pavement.

### 7.5 MIX STABILITY

The mix shall possess sufficient stability so that premature breaking of material in the spreader box does not occur. The mixture shall be homogeneous during mixing and spreading; it shall be free of excess water or emulsion, and free of segregation of the emulsion and aggregate fines from the coarser aggregate.

#### 7.6 APPLICATION RATE

The application rates, square yards per cubic yard of mix specified, are average rates; the surface texture variation throughout the work will dictate the actual spreading rates. The strike-off squeegee shall be adjusted to provide a microsurface thickness which will completely fill the surface voids and provide an additional thickness not exceeding one and one-half times the largest top-size stone. The requirement of 1-1/2 stone depth does not apply to rut filling operations as these depths vary greatly according to the surface irregularities.

#### 7.7 JOINTS

No excessive build-up or unsightly appearance shall be permitted on longitudinal or transverse joints. A maximum of 4.0" overlap will be permitted on longitudinal joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the work. Half passes and odd width passes will be used in minimal amounts. If half passes are used, they cannot be the last pass on any area. Care shall be taken to ensure straight lines along curbs and shoulders. No runoff will be permitted on these areas.

Construction joints shall be neat in appearance and shall be tapered or feathered to conform to the existing surface. All excess material shall be removed from the surface upon completion of each run.

#### 7.8 HANDWORK

Approved squeegees and lutes shall be used to spread the mixture in areas inaccessible to the spreader box and in other areas where hand spreading may be required.

#### 7.9 PROTECTION OF MICROSURFACE

Adequate means shall be provided by the Contractor to protect the uncured product. Any damage done to the product shall be repaired at the Contractor's expense.

#### 7.10 DAMAGE TO MICROSURFACE

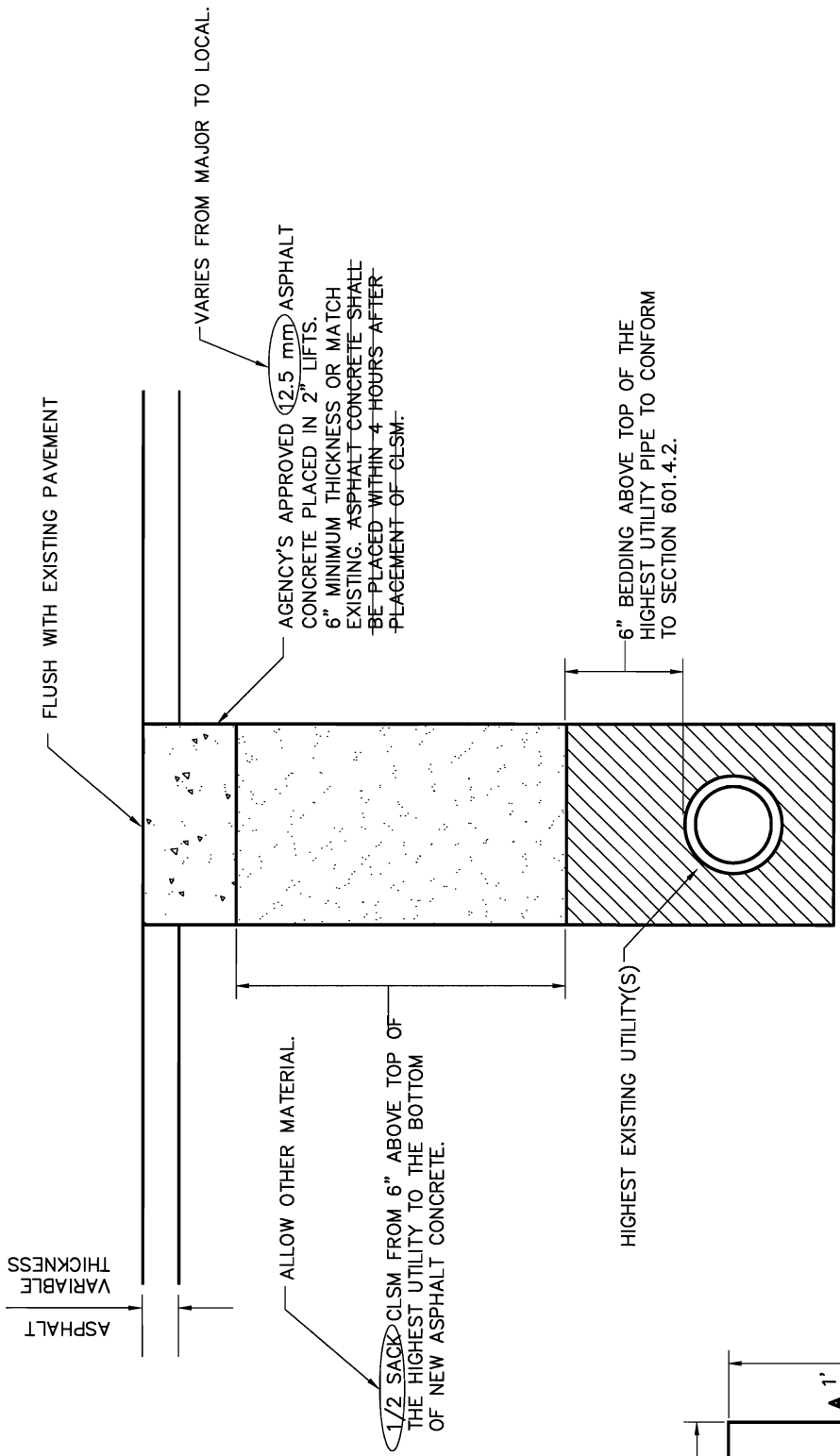
The Contractor's responsibility to replace microsurface damaged by unexpected rain after spreading shall be limited to the period within four (4) hours of placement of the microsurface.

8. PAYMENT

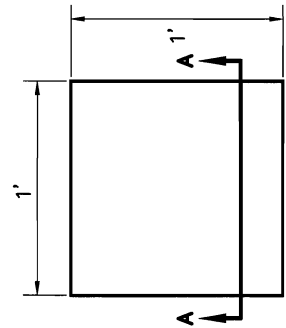
The micro-surfacing shall be paid for by the weight of the aggregate and weight of emulsified asphalt, as shown on certified weight tickets from the supplies delivered to the project, less weigh backs. The price shall be full compensation for furnishing, mixing and applying all materials; and for all labor, equipment, tools, design tests, and incidentals necessary to complete the job as specified herein.



CASE 08-14



SECTION A-A



POTHOLE PLAN VIEW  
(NOMINAL DIMENSIONS)

DETAIL NO. <b>212</b>	MARICOPA ASSOCIATION of GOVERNMENTS	STANDARD DETAIL ENGLISH	UTILITY POTHOLE REPAIR	REVISED CASE 08-14	DETAIL NO. <b>212</b>
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